ADHESIVO ESPECIAL PARA PLÁSTICOS

Descripción	Contenido ml	Art. Nº	U/E
Adhesivo plástico especial 2k	38	**0893 480 001**	1
Pistola de doble cartucho 	-	**0891 893 486**	1

Aplicación:

Para la adhesión de todo tipos de plasticos entre ellos y con otros materiales. Especialmente indicado para plasticos de dificil ahesión como PP, PE, LDPE, HDPE y PTFE.

Modo de empleo:

El soporte debe estar seco y libre de polvo, aceite y grasa. No utilizar los primeros 2 cm para realizar la unión, ya que puede que la mezcla no sea perfecta. Unir ambas partes tan pronto como sea posible después de la aplicación del adhesivo. Tiempo de trabajo 5 minutos a +20°C. Seco al tacto en dos horas a +20°C. Consigue resistencia a la rotura en 8 horas a +20°C.

Adhesivo de 2 componentes para plásticos, especialmente PP/PE/PTFE

- Unión rápida y resistente.
- Excelente adhesión de plásticos entre si y con materiales de diferente naturaleza.
- No es necesario el uso de imprimaciones ni activadores.
- Resistente a la humedad y a los agentes químicos.
- Apropiado para su uso en mantenimiento en general, automoción, mecánica, electrónica, óptica, modelismo, etc...

Fuerza de tracción y fuerza al cizallamiento en N/mm²

ABS	6
PVC	12
PE	3
PP	5.2
PA	3.6
PMMA	12
PC	9.2
Acero	12
Acero inoxidable	12
Aluminio	12.2
Haya	11

Las partes unidas sufren una fuerza de cizallamiento, una hacia cada lado en horizontal, que estresa la unión.
Para alcanzar la máxima fuerza de adhesión la superposición de las superficies debe ser tan grande como sea posible.

WACKER

CREATING TOMORROW'S SOLUTIONS

CENUSIL®

ELASTOSIL®

CONSTRUCTION I SILICONE SEALANTS

OUTPERFORMING IN SEALING NEEDS

SILICONE SEALANTS FOR SUSTAINABLE SOLUTIONS

STRIVE FOR AND BENEFIT FROM HIGH-PERFORMANCE SILICONE SEALANTS

Silicone sealants have become vital components in building and assembly in today's demanding world. More importantly they are indispensable as sustainable products in essentially all key industries. The CENUSIL® and ELASTOSIL® silicone sealant brands are the products of choice for construction and industrial applications from connection and expansion joints to sanitary sealing needs. Furthermore, if you are seeking specific sealants – whether suitable for natural stone, displaying fire retardancy properties or requiring compatibility in food-contact applications our portfolio meets these needs.

Seek Your Advantages

Silicones show significant advantages over alternative technologies: Ensure you benefit from the advantages gained in your specific application by selecting the appropriate product. WACKER's silicone sealants

- Give outstanding weathering and aging properties
- Display unparalleled UV stability and temperature resistance
- Exhibit constant stress-strain values at extreme temperatures (-30 °C to 80 °C) rendering outstanding suitability where joint expansion occurs
- Remain flexible at widely varying temperatures (-40 to 150 °C)

Opt For Sustainability

Silicones offer a number of properties allowing efficient processes and optimized products – thereby contributing to sustainability.
WACKER's silicone sealants

- Have greater longevity over alternative sealing systems
- Improve process efficiency, energy consumption, and generally increase cost-efficiency
- Permit airtight sealing of windows and doors reducing invasion of environmental pollutants
- Reliably protect windows and masonry in extreme weather conditions, thus preventing moisture, cold and heat influx

Go for the Optimum

WACKER is one of the world's leading construction solution providers. Whether new construction or refurbishment, WACKER products meet the most exacting demands by offering the best balance between quality and cost-efficiency. Our comprehensive portfolio – based on a unique combination of two fully fledged technology platforms silicones and polymer chemistry – as well as our competent support is geared to select the optimum for your specific request. Talk to us! **www.wacker.com/construction**

PRODUCT OVERVIEW – PROPERTIES AND APPLICATIONS

Properties	Densitiy at 25 °C (ISO 1183-1 A) [g/cm³]	Consistency (ISO 7390 Profile U 20)	Extrusion Rate (3 mm Die Press Pressure 6.3 bar) [g/min]	Skin-forming Time 23 °C/50 % RH) [min]
ELASTOSIL® 4100	1.02	Non-sag	450	20
ELASTOSIL® 4300	1.03	Non-sag	250	15
ELASTOSIL® 4500	1.03	Non-sag	250	20
ELASTOSIL® 4710	1.02	Non-sag	450	10
ELASTOSIL® 5000, 5100	1.01	Non-sag	500	20
ELASTOSIL® 6000, 6100	0.98	Non-sag	800	25
ELASTOSIL® 7000, 7100 N	1.02	Non-sag	200	35
ELASTOSIL® 7600	1.50	Non-sag	150	25
ELASTOSIL® 7750 N	1.40	Non-sag	130	20
ELASTOSIL® 8000 N, 8100 N	1.01	Non-sag	300	35
ELASTOSIL® 8510	1.02	Non-sag	400	15
ELASTOSIL® 9000 N, 9100 N	0.99	Non-sag	400	35
CENUSIL® 631	0.97	Non-sag	900	20

	Acetoxy (Acid Cure)		Alkoxy (Neutral Cure)	
Application	**Generally Appropriate**	**In Demanding Applications**	**Generally Appropriate**	**In Demanding Applications**
Glazing	ELASTOSIL® 5100**	ELASTOSIL® 4100**	ELASTOSIL® 8100 N**/8000 N	ELASTOSIL® 7100 N**
Perimeter			ELASTOSIL® 7100 N**	ELASTOSIL® 7750 N*
Sanitary	ELASTOSIL® 6100**	ELASTOSIL® 5100**	ELASTOSIL® 9100 N**	ELASTOSIL® 8100 N**
General Purpose	CENUSIL® 631**	ELASTOSIL® 6100**	ELASTOSIL® 9100 N**	ELASTOSIL® 8100 N**/ 8000 N
Specialty Sealants				
Natural stone				ELASTOSIL® 8510**
NSF grade		ELASTOSIL® 4710		
Aquarium		ELASTOSIL® 4300		
Fire protection				ELASTOSIL® 7600*
High temperature		ELASTOSIL® 4500		

* Filled systems
** Contains fungicide

Tensile Strength (ISO 8339) [N/mm²]	Elongation At Break (ISO 8339) [%]	Modulus At 100% Elongation (ISO 8339) [N/mm²]	Shore A Hardness (ISO 868)	Tear Strength (ISO 34-Meth.C) [N/mm]	Movement Capability (ISO 9047) [%]
0.6	250	0.35	20	4.2	25
0.8	200	0.55	22	6.1	25
0.7	250	0.45	25	4.2	–
0.6	250	0.37	20	4.2	25
0.7	250	0.38	18	4.5	25
0.6	150	0.36	18	4.0	–
0.7	300	0.38	24	4.6	25
0.6	300	0.40	25	4.0	25
0.5	250	0.40	22	5.0	25
0.7	300	0.37	24	4.5	25
0.5	250	0.35	21	4.0	25
0.5	250	0.37	24	3.0	20
0.6	250	0.30	14	5.0	12,5

IN PURSUIT OF INNOVATION AND QUALITY

With over 60 years' experience in silicon chemistry, WACKER played a pioneering role in developing silicone sealants and remains a technological leader in this area. State-of-the-art plants manufacture silicone sealant compounds – from silicon metal down to the ready-to-use cartridge. Our 4 plants across the globe – Burghausen, Nünchritz, Jincheon and Zhangjiagang – supply world markets with a sealants portfolio in accordance with regional specifics.

Your Qualified Advisor

Our local staff offers the expertise and service sought by today's demanding customers across five continents. Our regional Technical Centers attend to varying customer requests as well as giving support in the areas of certification by the diverse regional institutes. Turnkey solutions as well as optimisation of formulations is a service we are more than happy to give our customers. Our Research & Development team constantly looks to improve the products. Congruent with increasingly stringent EH&S regulations we constantly screen raw materials used and modify sealants accordingly. Our particular range of specialty silicone sealants – from food-grade products to systems suitable in natural stone sealing – reflects our endeavours to offer leading-edge solutions.

Your Benefits

- Close proximity to a supplier and his services offering various options from container to drum, down to cartridge
- Extensive expertise in silicone sealant manufacture
- External certification support
- Proficiency in cartridge management and assistance in implementing private label business
- Consistent quality according to industry standards guarantees dependability
- Technological innovation means cost-efficient and sustainable products

Two Curing Options

Room temperature vulcanizing (RTV) systems, curing by contact with moisture vapor in the air.

Acidic Cure (Acetoxy):

Outstanding adhesion to silicate substrates thereby highly suitable for glass and ceramics.

Unsuitable for alkaline substrates such as concrete, mortars or corrodible surfaces such as metals

Neutral Cure (Alkoxy):

Excellent adhesion to metal, plastics, concrete as well as glass and ceramics.

Particularly suitable as non-corrosive sealing solution for connection and expansion joints.

Primers

The ELASTOSIL® and CENUSIL® silicone sealant range has been developed to adhere to a wide range of substrates. However, some substrates continue to present a problem with respect to adhesion profile – non-polar plastics as well as certain metals will require priming to achieve optimum adhesion. WACKER has a range of specially developed ready-to-use primers here. For further details speak to us.

Industry Standards/CE Labeling

Many grades from our product range have been specifically tested according to various standards across the globe.

If you require documentation as to whether a given sealant meets specific ASTM, DIN or EN standards or complies with local regulations such as SNJF or AENOR, do address us with your particular requirement and we will outline our findings for the grade in question. As the CE labeling legislation comes into force in Europe, relevant documentation has been compiled by our EH&S staff. Feel free to address us if you require support here.

WACKER

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WACKER SILICONES

ELASTOSIL®

BONDING, SEALING, POTTING / ENCAPSULATION AND COATING WITH RTV SILICONE RUBBER COMPOUNDS

CREATING TOMORROW'S SOLUTIONS

Where to Find What

WHOEVER IS FAMILIAR WITH WACKER RTV SILICONE RUBBER COMPOUNDS KNOWS THEIR STRENGTHS

LOOK FOR A PRODUCT AND FIND IT!

Room-temperature-vulcanizing silicone rubber compounds are a traditional mainstay of WACKER SILICONES' product portfolio. Our range of ready-to-use products for the numerous applications in the fields of bonding, sealing, potting/encapsulation, coating and mold-making is accordingly impressive. Equally impressive, however, is WACKER SILICONES' experience in the processing techniques and material requirements specific to these industries: from DIY-scale right up to industrial production lines.

With more than 50 years' experience in silicone technology and an above-average commitment to R&D, WACKER SILICONES has long since become indispensable to its customers for their technical progress. This would not be possible without ongoing, confidential dialog – without the trading of knowledge, experience and ideas that powers a shared undertaking. Our joint undertaking right here and now is to find the ideal product for your application.

You can always rely on WACKER's technical support service.

BENEFIT FROM QUALITY

Thermal Resistance

Thermal resistance is just one of the outstanding material properties that characterize silicones. For applications involving temperatures above 150 °C, silicones are the only elastomer candidate. Unlike other elastomers, they can withstand temperatures up to 180 °C permanently; special heat-stabilized grades will even withstand brief exposure to temperatures of up to 300 °C. For maximum thermal stability, it is important that the silicone rubber cures, or vulcanizes, completely. Thermal stability can be enhanced still further by subjecting the silicone compound to subsequent, well-ventilated post-curing, during which the temperature is raised slowly.
At the other end of the scale, silicones remain flexible down to -50 °C, with specialty grades resisting temperatures as low as -110 °C.

Expansion

Silicone rubber elastomers have a coefficient of linear expansion that is a direct function of filler loading and hence of specific gravity. The higher the density of a rubber, therefore, the lower is its coefficient of linear expansion. Typical values are in the range of $2 \cdot 10^{-4}$ m/mK and are thus substantially higher than for other potting/encapsulation compounds. Since silicone rubber undergoes relatively pronounced expansion during the curing process, the shrinkage encountered on cooling is likewise pronounced. This “apparent” shrinkage must be taken into account in advance.

Bonding Properties

Silicone rubber grades adjusted to be self-adhesive are suitable for many substrates. The bond quality will depend on the nature of the material to be bonded, the stress, the kind of bond and possibly the surface treatment. The most superior bonds are obtained on oxidic and siliceous surfaces. Good adhesive strength is also obtained with a number of plastics.

In other instances, it may be necessary or advisable to prime the substrate or subject it to flame or plasma treatment prior to bonding. Surfaces must always be clean and free of grease. Low-boiling solvents such as acetone[1] or aliphatic hydrocarbons are suitable cleaning agents.

Release Properties

The surfaces of silicone elastomers show a pronounced release effect when used with inorganic and organic materials such as gypsum, concrete, polyester, epoxide, polyurethane, polyamide, polystyrene, PVC, wax and metal alloys. This effect is exploited in the use of silicone rubber compounds to make molded parts and reproductions. WACKER supplies pourable, spreadable and kneadable silicone rubber grades to suit a wide variety of applications.

Mechanical Properties

WACKER supplies RTV silicone rubber compounds to meet a wide range of mechanical requirements. Compounds with a processing viscosity in excess of 10,000 mPa s yield elastomers with excellent tensile strength, elongation at break and tear strength. Low-viscosity products (less than 10,000 mPa s) yield elastomers with mechanical properties that are generally not as strong.

RTV silicone foams constitute a special class of RTV silicones. Although their mechanical properties are less good on account of their porous structure, these foams offer excellent damping and insulation. Their compressibility makes them ideal for use in seals.

Silicone gels are another special class of RTV silicones. These very soft materials (Shore A < 0) have an extremely low elastic modulus, so that even large temperature differences cause only little thermomechanical stress. Silicone gels are thus ideal for protecting delicate electronic components.

[1] Please pay attention to the material's flammability.

Permeability to Gas and Water-Vapor

At room temperature, the gas permeability of silicone rubber is about ten times that of natural rubber. Not until 100–150 °C do the permeability values converge. Under normal conditions, silicone rubber may contain some 15–20 vol % of dissolved air. Reducing or increasing the gas pressure causes a decrease or increase in the quantity of dissolved gas. Consequently, a sudden pressure drop will make dissolved air become visible in the form of bubbles. Special care must be taken when metering equipment is used, as the use of compressed air to convey the compound can also cause bubbling. Similar effects can occur on rapid heating, as the gas solubility decreases with a rise in temperature. The water-vapor permeability, as determined in accordance with DIN 53122 under climatic conditions D and a film thickness of 2 mm, is about 20 g/m^2 d.

Chemical Resistance

Silicone rubber is resistant to aqueous solutions, diluted acids and bases and polar solvents. Solvents such as ketones, esters and hydrocarbons may cause reversible swelling of the silicone rubber but do not destroy its chemical structure. Products with a high filler loading and/or that are very hard tend to swell less than softer compounds. The only way to remove cured silicone rubber from a surface is by destroying the rubber completely with concentrated sulfuric acid, alcoholic alkali solution or the like.

Radiation Resistance

Silicone rubber can be exposed to high doses of electromagnetic radiation – from the microwave to the UV range – without any noticeable effects. In terms of radiation resistance and hot-air resistance, it is superior to all other organic elastomers. This explains the use of silicone rubber in such a wide variety of applications, ranging from microwave cookers to solar generators.

Flame Resistance

The auto-ignition temperature of cured silicone rubber is about 430 °C. The resultant flame burns at 750 °C. In addition to the usual combustion products, namely carbon dioxide and water, silicon dioxide is produced and forms an insulating layer of ash on the surface. Silicones are flame-resistant – even without the addition of halogen compounds, which can generate corrosive and toxic gases in a fire. Generally speaking, their fire performance is better than that of many organic elastomers and casting resins.

Environmental Compatibility

Silicones have the same basic chemical structure as quartz. The cured rubber therefore poses no known ecological or physiological risks.

Thermal Conductivity

The thermal conductivity of most silicone elastomers is in the range from 0.15–0.25 W/(Km) at room temperature. However, values up to 2.5 W/(Km) may be obtained with specialty grades that have a high filler loading.

Electrical Properties

The electrical properties of silicone rubber remain almost constant over the temperature range from -45 °C to +180 °C. At room temperature they compare well with those of other insulating materials. What makes silicone rubber elastomers far superior to other materials, however, is the fact that elevated temperatures have no appreciable effect on their insulation resistance, dielectric strength or dissipation factor. These properties even remain constant when the compounds are immersed in water.

Normally, silicone elastomers are electrical insulators. However, they can be rendered electrically conductive by adding specialty fillers.

Unlike organic elastomers and casting resins, RTV silicone rubber shows excellent arc and tracking resistance. Specialty grades can attain values > 3.5 kV (IEC 587) for arc resistance and > 300 s for tracking resistance.

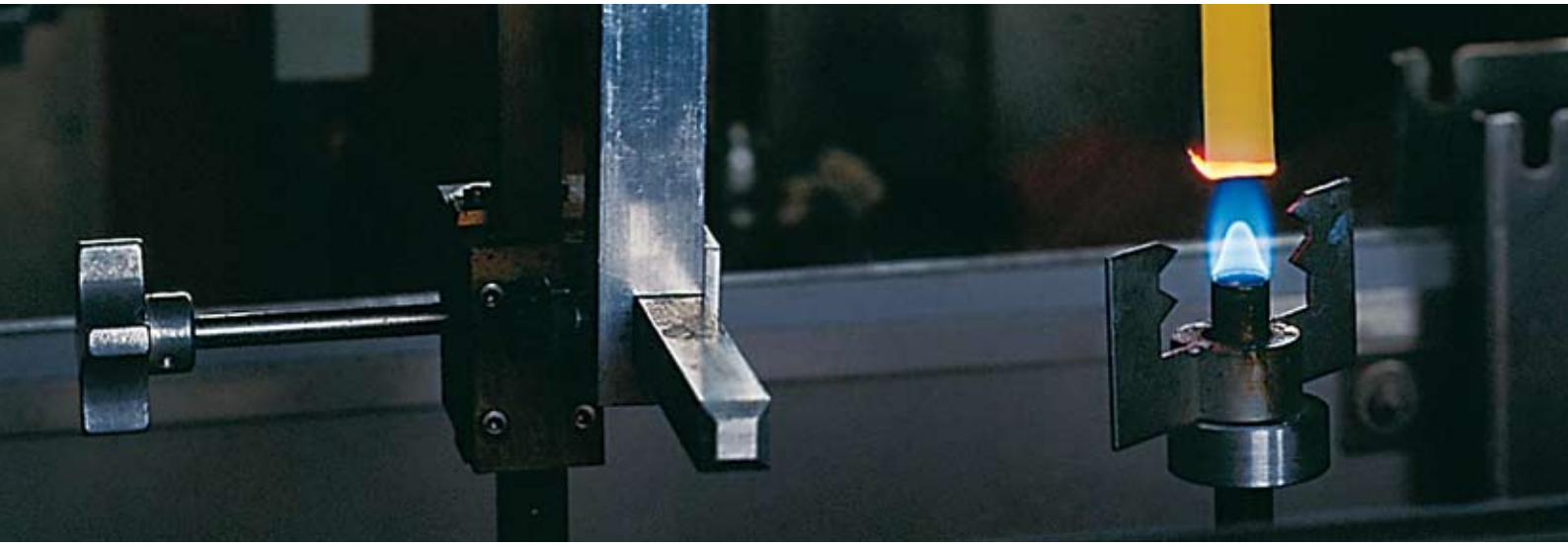
Optical Properties

The color and appearance of silicone rubber is determined by the fillers selected for the compound in question. The light permeability of thin layers of unfilled materials is almost 100 % in the visible range from 400 to 760 nm. These materials only become opaque in the UV range below 200 nm. Their refractive index n_D25 is between 1.410 and 1.404.

Storage Stability

SEMICOSIL®, ELASTOSIL® and WACKER SilGel® silicone rubber grades have a shelf life of up to 24 months (the exact time will depend on the grade in question) when stored in the original, sealed containers at between 5 °C and 30 °C. Storage beyond the date specified does not necessarily mean that the material is unusable, but a quality check should be performed on the most important properties.

DISCOVER DIVERSITY



By virtue of their diverse and excellent properties, RTV silicone rubber compounds from WACKER have a wide variety of bonding, sealing, potting/encapsulation, coating and mold-making applications[2].

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
- High chemical purity

[2] You will find more on the subject of mold-making in our brochure “ELASTOSIL® M Mold-Making Compounds for Maximum Precision.” Please contact your WACKER sales office.

SUPERIOR BONDING

Mechanical assembly techniques such as screwing and bolting, riveting, welding and soldering are being increasingly supplanted by modern adhesive bonding methods. The advantages are convincing:

Advantages of Adhesive Bonding

- More uniform stress distribution, as adhesives distribute stresses over the entire bonding area and thus minimize high localized stress concentrations
- An adhesive bond is simultaneously a seal and thus prevents the corrosion that so frequently occurs with mechanical fasteners
- Thanks to the high flexibility and low elasticity modulus of adhesive bonds, cyclic temperature loading causes only small thermomechanical stresses in bonded substrates with different coefficients of thermal expansion
- Ability to bond dissimilar materials
- Thanks to the good insulating properties of silicones, metals with different electrochemical properties can be bonded without risk of galvanic corrosion. The dimensions of the substrate remain practically unchanged
- An adhesive bond affords good vibration damping, as the silicones have a much lower elasticity modulus than the substrate
- Cost savings at various manufacturing levels: reduced warehousing, reduced labor costs thanks to automated adhesive application, less critical machining tolerances for the parts to be bonded

Products for Adhesive Bonding

WACKER offers products with widely differing property profiles for the adhesive bonding of materials:

- From flowable to non-sag
- Hardness levels from Shore A 10 to Shore A 80
- From transparent to black
- Electrically insulating or electrically conductive
- Thermally conductive up to W/(Km) (on request), but electrically insulating

FULLY AUTOMATED SEALING

Sealing technologies

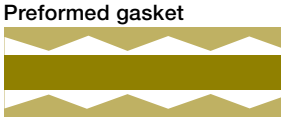
	Preformed gasket	FIPG	LIS	CIPG
				
Application	Injection molded separately	Pasty to flowable, fully automated application	Pasty to flowable, fully automated injection	Pasty to flowable, fully automated application
Adhesion	None	Two-sided	None	One-sided
Assembly	After curing	Prior to curing	Prior to injection and curing	After curing
Disassembly	Possible	Impossible	Possible	Possible
Sealing function		Due to adhesive bonding	Due to expansion	Due to compression
Silicone sealants	ELASTOSIL® R or LR	ELASTOSIL® RTV-1 and RTV-2	ELASTOSIL® silicone sealant LIS (RTV-2)	ELASTOSIL® RTV-1, RTV-2 and ELASTOSIL® SC[3]

Fig. 1

Seals are frequently exposed to extreme conditions. As the interface between inside and outside, hot and cold or wet and dry, they have to be able to withstand all of these opposites.

Silicone seals are either manufactured in a separate injection-molding process and subsequently incorporated into the multi-component part, or else they are cured “in place”. Curing can take place before or after the components have been assembled:

In wet assembly (FIPG), the parts to be sealed are assembled before the silicone rubber cures; accordingly, the accuracy of the part geometry is less critical. The adhesion of the silicone rubber to the components enhances the reliability of the seal.

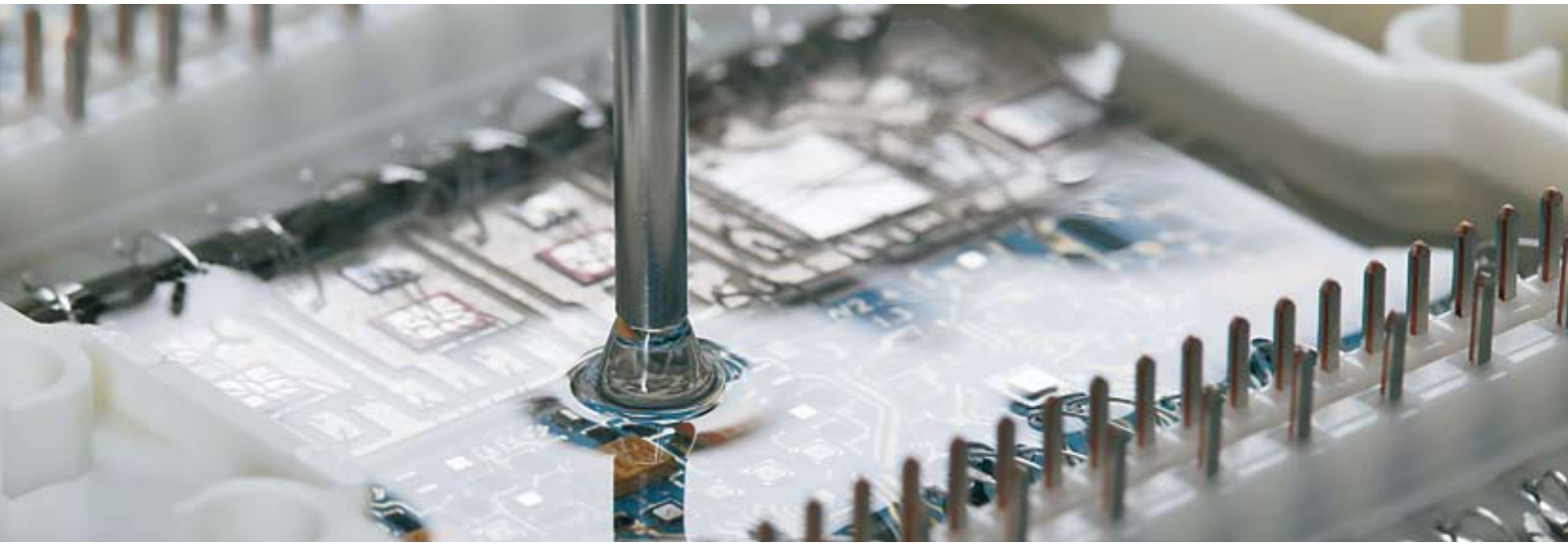
In dry assembly (CIPG), the seal adheres to the part to be applied and thus stays in place without being secured in any way. The seal can be dimensioned such that the joined components are mutually noise and vibration-damped.

This fully automated process using WACKER silicones offers a number of benefits:

- Less material input
- Simplified warehousing
- Fully automated application
- Flange surface needs no special post operations
- Simple groove design
- Seals stay in place until time of assembly

[3] Foams as dust and splash protection; large tolerances and low contact pressure

HIGH-VOLUME POTTING AND ENCAPSULATION



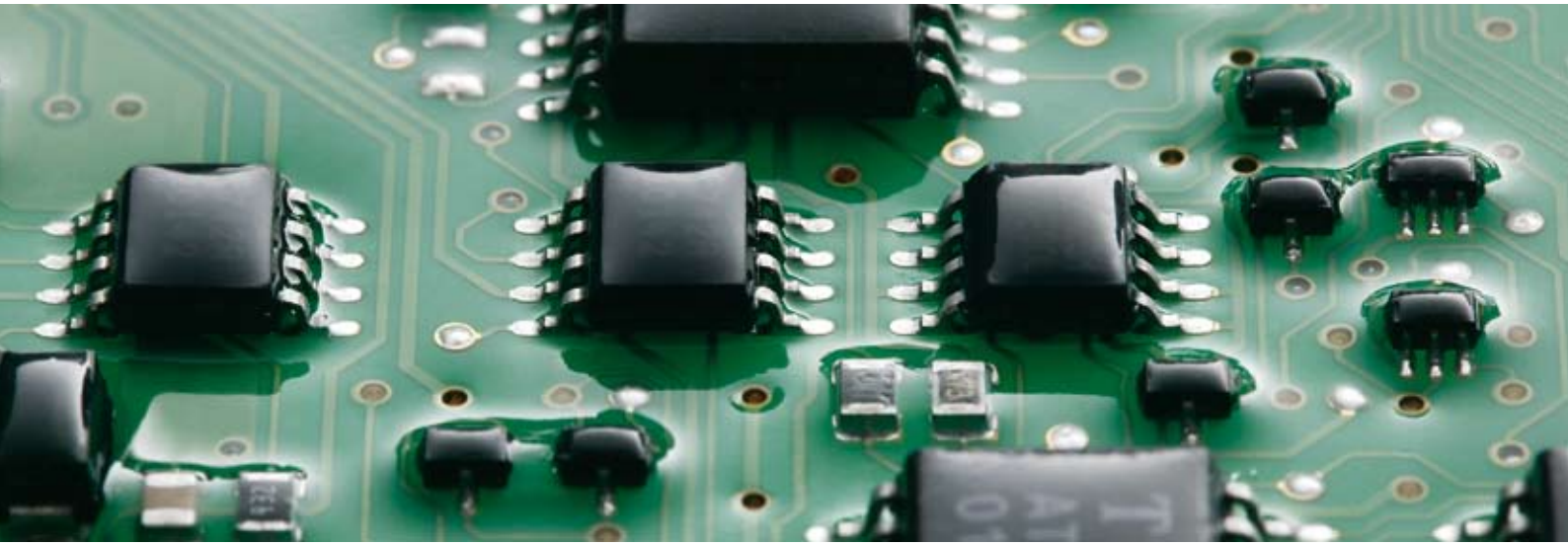
Potting and encapsulation – as methods of partially or completely covering microchips, hybrid circuits and semiconductor power modules – have proved extremely successful: they are particularly effective ways of protecting such components from external influences.

WACKER offers a wide range of one and two-part products for potting/encapsulation applications. Extra-soft gels are available for sensitive electronic devices such as bonded ICs. These gels ensure that the device will work properly even under conditions of extreme temperature fluctuations or strong vibration. For sensor applications, gels characterized by particularly low volatility and low bleed are becoming increasingly important. With its unique process for manufacturing polydimethylsiloxane, WACKER SILICONES is excellently positioned for this market.

Material Property Options

- Low viscosity or shear diluting
- Variable processing and curing times
- Soft to hard
- Transparent to opaque
- High flame resistance
- High thermal conductivity
- Fuel resistance, e.g. fluorosilicones
- Remarkable low-temperature flexibility (down to -100 °C)
- High thermal shock resistance
- Low shrinkage
- Good adhesion to polymer housings
- Low outgassing
- Low uncured-silicone bleed
- Pronounced damping property
- Specified low ion content

EFFICIENT COATING



Coatings or protective lacquers for PCBs or hybrid devices are also known as “conformal coatings.” They afford protection against external influences such as dust, light, aggressive media, temperature fluctuations and mechanical stresses. They insulate electronic circuits from the surrounding environment or enhance the dielectric strength of highly complex modules.

Various methods are available for applying conformal coatings in volume production:

- Spray application
- Dip coating
- Flow coating
- Selective coating (partial cover)

Each of these techniques puts different demands on the protective lacquer in terms of its rheological, pot-life and curing characteristics. WACKER SILICONES offers customized products for each technique: both solvent-based and solvent-free. SEMICOSIL® and ELASTOSIL® silicone rubber grades meet the challenging functional, quality, reliability and cost-efficiency requirements of conformal coating production.

SYSTEMATIC SELECTION

WACKER offers different silicone rubber systems marketed under the brand names SEMICOSIL®, ELASTOSIL® and WACKER SilGel®. The processing properties differ too, sometimes substantially. It is therefore essential to select the silicone system that is best suited to your individual production requirements. Discuss the issue with your WACKER technical service manager. He will be glad to assist you.

Set Priorities

The end result is often the same. The various silicone rubber systems offered by WACKER merely constitute different ways of getting there (see Fig. 3).

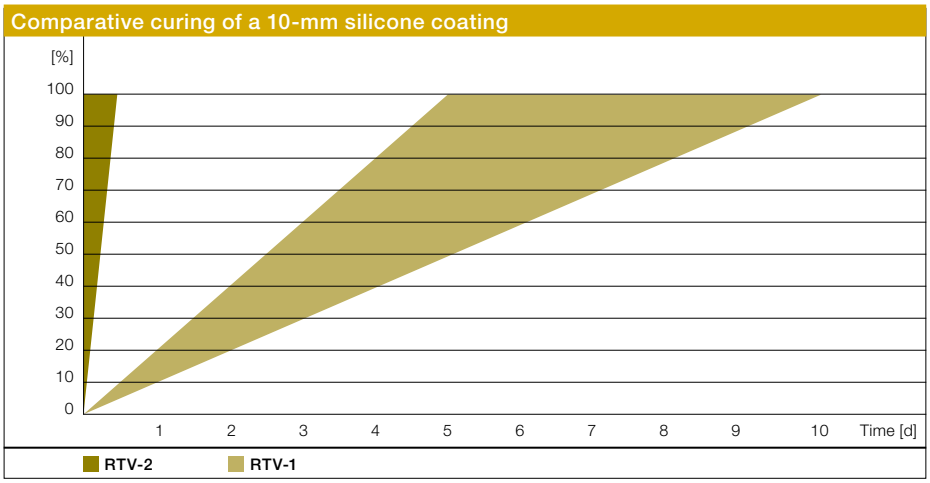


Fig. 2

Silicone systems and product requirements

Fast curing ^^

RTV-2 Silicones

- Addition-curing and condensation-curing 2-part systems that vulcanize at room temperature
- Dual-component metering equipment is needed to process them
- Rapid curing in the order of minutes is achieved by working at elevated temperatures or selecting a suitable curing agent

One-Part Systems

- One-part systems that cure exclusively at high temperatures
- Simple metering equipment suffices to process them
- Curing is fast, sometimes taking only minutes

RTV-1 Silicones

- One-part systems that cure at room temperature
- Simple metering equipment suffices to process them; these rubber grades can even be applied manually
- Atmospheric moisture is needed for curing

Easy processing >>

Fig. 3

APPRECIATING ONE-PART SYSTEMS

Condensation-curing RTV-1 silicones are ready-to-use, free-flowing to pasty 1-part products that cure at room temperature. Their popularity is explained by the ease with which they are processed (and the minimum of investment that is required) and by the outstanding properties of the cured products. By virtue of the wide variety of properties they offer, they are ideal for numerous bonding, sealing and coating applications.

ELASTOSIL® RTV-1 Silicone Rubber

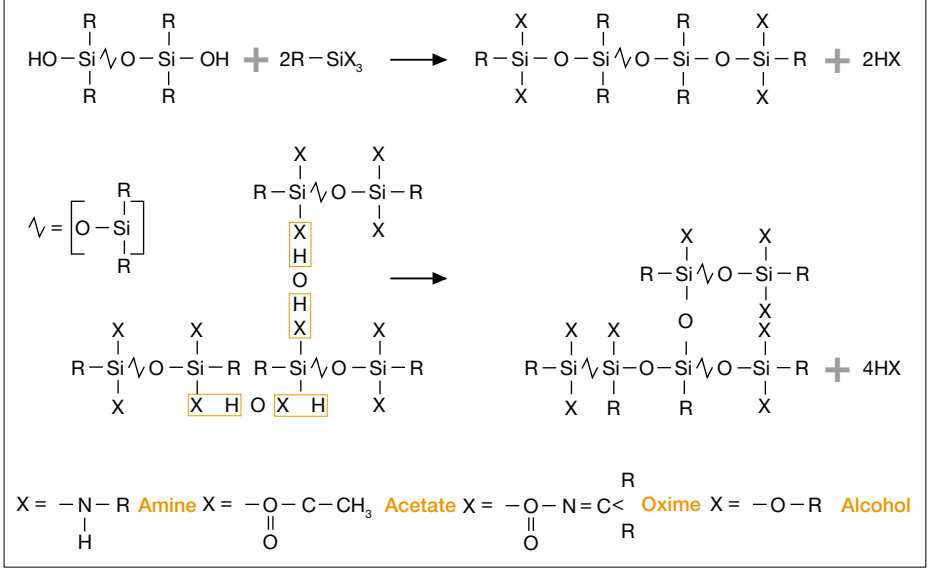


Fig. 4

The Advantages at a Glance

- Extremely easy processing
- Low capital investment for equipment
- Very good bonding to a variety of substrates

Chemistry

RTV-1 silicone rubber compounds from WACKER consist of polydimethylsiloxanes, curing agents, fillers and, in some cases, solvents and additives. During the compounding process, terminal OH groups on the polysiloxane react with the crosslinking agent to form curable products. The various systems available differ in the type of curing agent employed:

Alkaline systems release small amounts of amine while curing (ELASTOSIL® A grades).

Acidic systems release small amounts of acetic acid while curing (ELASTOSIL® E grades).

Neutral systems release small amounts either of an oxime or of an alcohol while curing (ELASTOSIL® N grades).

The crosslinking, i.e. curing or vulcanization, of RTV-1 silicone rubber grades takes place on exposure to atmospheric moisture. It starts with the formation of a skin on the surface of the silicone rubber and gradually works its way into the compound. The higher the relative humidity, the faster is the curing rate. Curing is not possible in closed systems without air access. In such cases, we recommend the use of RTV-2 silicone rubber grades.

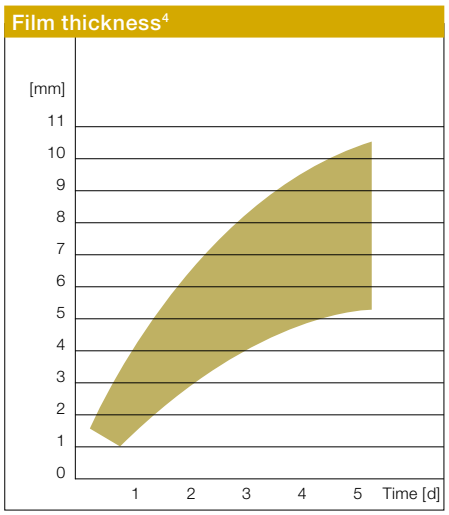


Fig. 5

If air access is from one side only, a film thickness of 10 mm should not be exceeded. Curing times can be greatly reduced by the application of heat, especially if the relative humidity is high and the rubber has been applied thinly. The temperature should be raised slowly in order to allow any solvents or hydrolysis products to evaporate. Final temperatures may be as high as 200 °C provided that the films are thin (less than 0.5 mm thick). If the films are any thicker, blistering is likely to occur. Curing is still possible at temperatures down to approx. -15 °C.

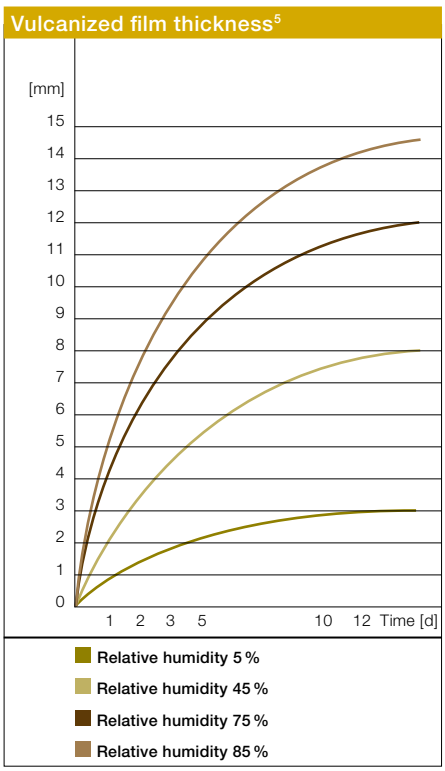


Fig. 6

Processing Guidelines

RTV-1 silicone rubber compounds may be applied manually or by machine. In the case of cartridges, either hand-operated or pneumatic guns are used. Automatic discharge or dispensing equipment is generally adopted for the larger containers. After dilution with anhydrous solvents, RTV-1 compounds can also be applied by airless spray guns. Optimum adhesion is achieved by pressing RTV-1 silicone rubber firmly onto the substrate surfaces. Parts to be bonded must be assembled immediately after the rubber has been applied, i.e. before a skin can form, and may need to be clamped.

Uncured RTV-1 silicone rubber may be removed with a spatula, paper or a rag, and any residues washed off with a solvent such as petroleum ether, toluene or trichloroethylene. All tools and processing equipment should likewise be cleaned immediately before the rubber has a chance to vulcanize. Once it has vulcanized, silicone rubber can only be removed mechanically, if necessary after using the previously mentioned solvents to make it swell.

Safety Precautions

The vapors comprising volatile by-products released during vulcanization and possibly also evaporated solvents should not be inhaled for any length of time or in high concentrations. The workplace should therefore be well ventilated. Uncured silicone rubber must not be allowed to get into contact with the eyes or mucous membranes, as it can cause irritation and acid burns.

[4] Curing rates of various RTV-1 silicone rubbers at 50 % relative humidity and 23 °C in aluminum pans measuring 24 mm in diameter and 18 mm in depth

[5] Curing rate of ELASTOSIL® A 33 as a function of relative humidity at room temperature

UNDERSTANDING TWO-PART SYSTEMS

There are two essentially different curing systems for RTV-2 silicone rubber:

Condensation-Curing Systems

Condensation-curing silicone rubber compounds consist of a primary component and a curing agent that contains the crosslinker (a catalyst). The primary component and the curing agent are typically mixed in a ratio of 8:1 to 12:1. After mixing, curing takes place with the elimination of alcohol.

Typical processing times for condensation-curing RTV-2 silicone rubber grades are about 10 min pot life and 70 min until the onset of curing (see Fig. 8).

Ultimate mechanical strength is reached after about 6 hours. These times can be varied within limits by adjusting the ratio of main component to curing agent. To ensure reliable processing, however, the pot life must not be less than 2 min. It is not advisable to speed up the reaction by increasing the temperature. The temperature must not exceed 90 °C before curing is complete, otherwise the silicone rubber could be destroyed.

Structural formulae illustrating condensation curing

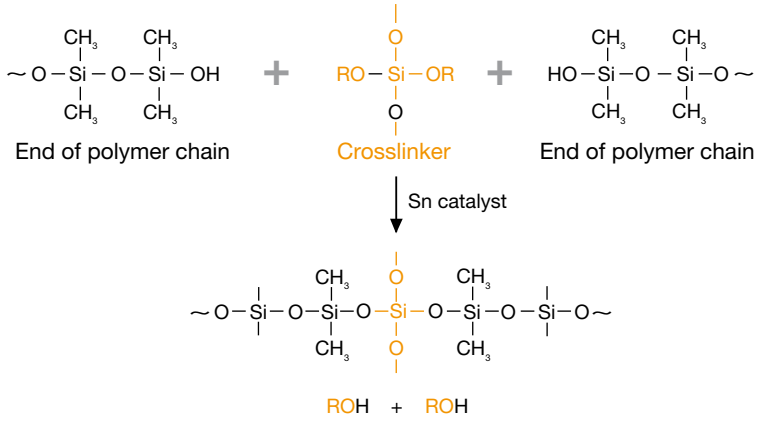


Fig. 7

Typical pot lives as a function of mixing ratio

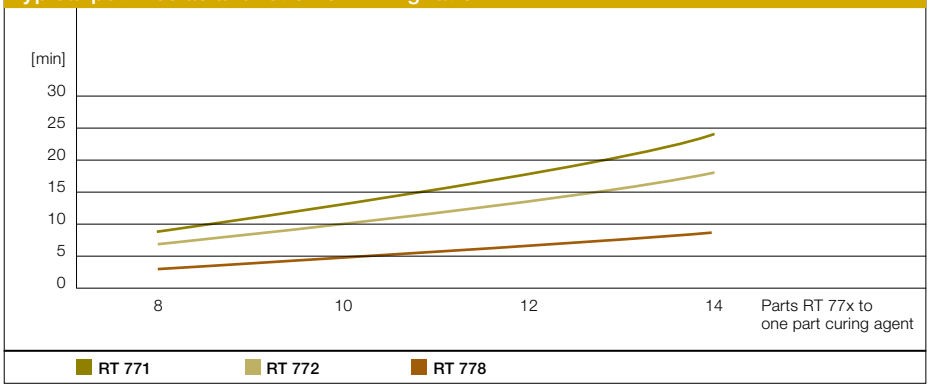


Fig. 8

The Advantages at a Glance

- Fast curing at room temperature, even of thick sections
- Very good thermal resistance
- No inhibition-related curing problems
- Curing rates can be adjusted within given limits by selecting “slow” or “fast” curing agents and by varying the quantities in which these are added
- The curing rate may be boosted by heating to a maximum of 80 °C; heating above 90 °C is apt to cause depolymerization (reversion)
- Only minor weight loss and shrinkage (0.2–2 % linear) occur on curing

Addition-Curing Systems

Addition-curing silicone rubber compounds consist of two components, one of which contains polymer and crosslinker, the other, polymer and a platinum catalyst. When the two components are mixed, they cure to form the elastomer product. During this reaction, the polymer chains are linked through hydrosilylation of the vinyl groups by means of the hydrogen-containing crosslinker. The curing rate is controlled here by the temperature, and not by the mixing ratio as in the case of condensation-curing RTV-2 silicone rubber grades. No by-products are formed on curing (see Fig. 9).

In addition to the 2-part systems, we also offer 1-part, addition-type, heat-curing silicone rubber grades. These are preferred whenever the procurement of a 2-part metering system is not practicable for technical or economic reasons.

The Advantages at a Glance

- Short curing times possible, even for grades with a long pot life
- Pot life can be adjusted with additives
- Curing can be accelerated by heating
- Irreversible crosslinking
- No weight loss on curing, and practically no shrinkage (< 0.1 %)
- No by-products
- Self-adhesive grades show excellent adhesion to a wide variety of substrates

Structural formulae illustrating addition curing

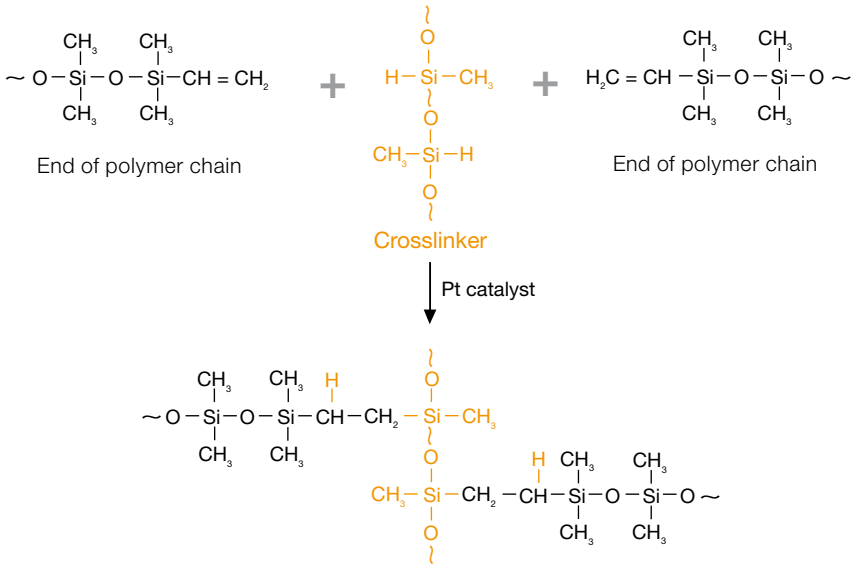


Fig. 9

ACCOMPLISHED PROCESSING

You will find detailed processing instructions for WACKER RTV-2 silicone rubber compounds in the supplementary sheet that accompanies this brochure (Room-Temperature-Vulcanizing Silicone Rubber Compounds). Please ask your WACKER sales office.

Viscosity

WACKER RTV-2 silicone rubber compounds lend themselves to a large number of processing techniques, including spraying, dipping, potting/encapsulating, silk-screen printing and automated application. The suitability of a compound for a particular processing method is dictated by its rheological properties, for example, its viscosity. This is measured in mPa s. RTV-2 silicone rubber compounds usually have a viscosity between 500 and 2,000,000 mPa s. Many RTV-2 silicone rubbers show non-Newtonian behavior, and so it is always necessary to quote the shear rate at which the viscosity was measured. The viscosity, for its part, depends on the preliminary treatment (e.g. stirring) and on the temperature. Precise temperature control is therefore essential, as also the fulfillment of certain requirements (stirrer speed and time) during preliminary treatment.

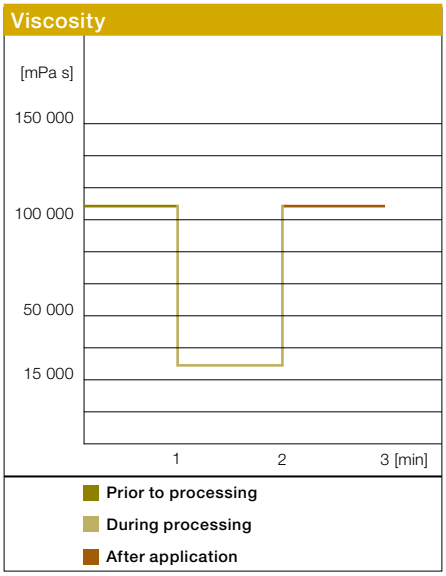


Fig. 10

Mixing and Applying

Flowable RTV-2 silicone rubber compounds are noted for their ease of processing in both small-scale and large-scale use. The two components are first mixed in the prescribed ratio to form a homogeneous compound. This may be done manually or by machine. The equipment employed must always be scrupulously clean. If the components have different colors, they should be mixed until the compound is totally streak-free. For economical, large-scale processing, especially of pasty/thixotropic grades, we recommend the use of metering equipment[6]. Air entrained during mixing must be removed from flowable products by evacuation at approx. 20 mbar before they are processed further.

The container should be four times the volume of the product, as the silicone rubber will foam extensively when the vacuum is applied. Metering equipment involving the use of compressed air may be problematic due to possible bubble formation. The reason for this is the high gas solubility of silicones. In the case of pasty/thixotropic RTV-2 grades, any dissolved air will have already been removed during filling in the plant. In such cases, metering equipment fitted with follower plates is used to dispense the product directly from the original containers. As for silicone foams, selective admixing of gases into the components can serve to enhance the structure of the foam.

Curing

The pot life and curing time of condensation-curing silicone rubber compounds may be influenced, for one, by selection of an appropriate curing agent (slow or fast curing agent) and, for the other, by the amount of curing agent used.

While heat is not necessary for the vulcanization of condensation-curing silicone rubber grades, it will substantially shorten the time needed for addition-curing silicones to vulcanize. Exactly how much time is required will depend on the grade in question and on the heat transfer rate. Suitable heat sources include heated metal molds, circulating-air ovens and IR tunnels. Several addition-curing silicones have been developed that have extended pot lives ranging from one day to several months. Curing is effected in this case at high temperatures of up to 200 °C. Please consult the respective product leaflets for details.

[6] Please ask us for the addresses of manufacturers.

Vulcanization of addition-curing silicone rubber compounds may be substantially impaired by contact with substances containing amino, sulfur or tin compounds. This is usually indicated by tackiness, and can be avoided by appropriate preliminary tests.

Pot Life

The pot life of RTV-2 silicones is heavily temperature-dependent, especially that of addition-curing products: a rise or fall in the temperature shortens or prolongs the pot life accordingly. The average pot life of RTV-2 silicone rubber compounds varies between 30 minutes and 6 hours, while for some grades it is of the order of a few minutes. It can also be adjusted over a wide range – in the case of condensation-curing systems by means of special curing agents and in the case of addition-curing systems by means of additives – to suit the application in question (see Fig. 11).

A number of addition-curing grades offer a pot life of up to several days at room temperature, and certain compounds are even supplied as one-part products with an appropriately long shelf life. These specialty products do not allow the fine adjustments (see graphs) with Inhibitor PT 88 (longer pot life) or Catalyst EP (shorter pot life).

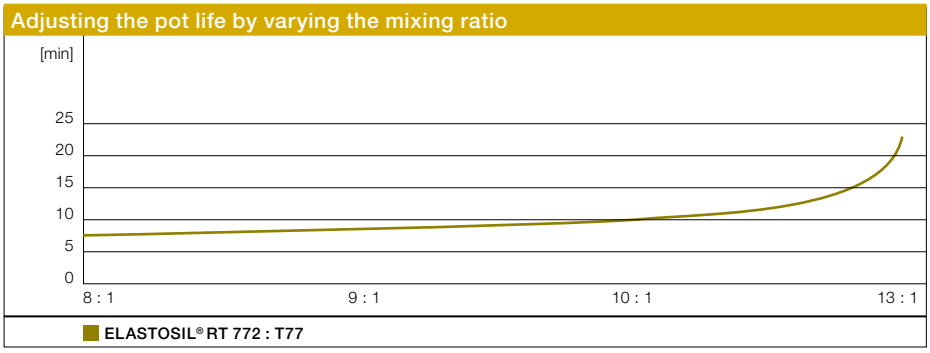


Fig.11

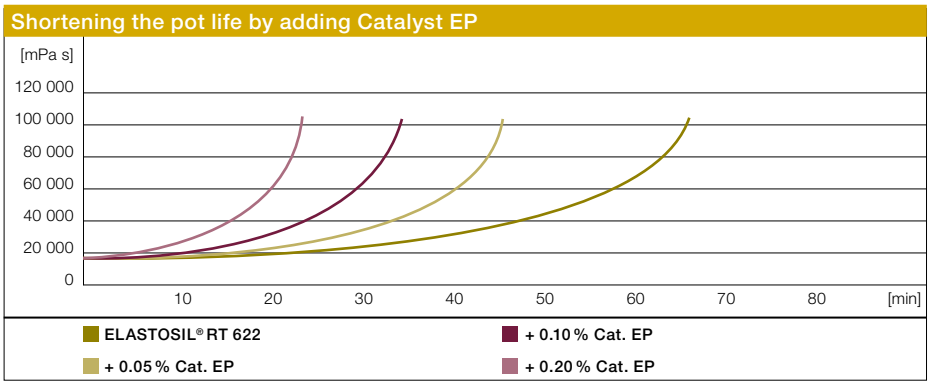


Fig.12

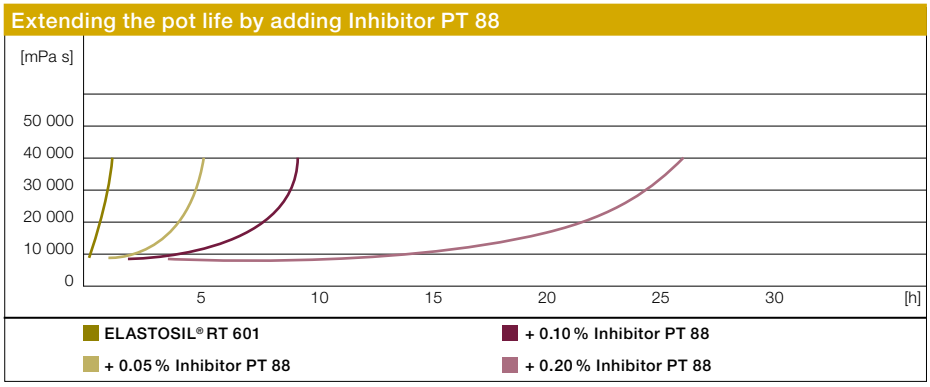
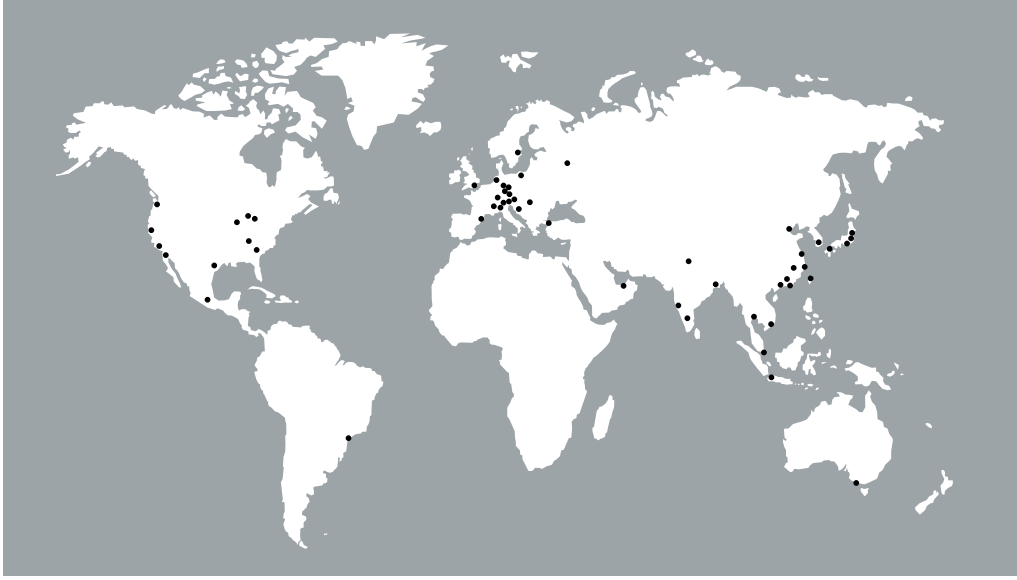


Fig.13

WACKER AT A GLANCE



WACKER
is a technological leader in the chemical and electrochemical industries and a worldwide innovation partner to customers in many key global sectors. With around 14,400 employees, WACKER generated sales of EUR 2.76 billion in 2005. Germany accounted for 21 % of sales, Europe (excluding Germany) for 31 %, the Americas for 22 % and Asia-Pacific, including the rest of the world, for 26 %. Headquartered in Munich, Germany, WACKER has some 20 production sites worldwide and a global network of over 100 sales offices.
With R&D spending at 5.3 % of sales in 2005, WACKER is among the world's most research-intensive chemical companies.

WACKER SILICONES
is a leading supplier of complete silicone-based solutions that comprise products, services and conceptual approaches. As a provider of solutions, the business division helps customers press ahead with innovations, exploit global markets fully, and optimize business processes to reduce overall costs and boost productivity. Silicones are the basis for products offering highly diverse properties for virtually unlimited fields of application, ranging from the automotive, construction, chemical, electrical engineering and electronics industries, through pulp and paper, cosmetics, consumer care and textiles, to mechanical engineering and metal processing.

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WACKER FINE CHEMICALS
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Siltronic
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06.06

WACKER

CREATING TOMORROW'S SOLUTIONS

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WACKER SILICONES

ELASTOSIL®

COMPARING RTV SILICONE RUBBERS

CREATING TOMORROW'S SOLUTIONS

BONDING, FIXING, SEALING: PART 1.

Product	Properties	Color	Density	Viscosity	Pot life/ skin-over time	Curing time
1-Part Condensation-Curing RTV-1			[g/cm³]	[mPas]	[min]	
ELASTOSIL® A 4	Amine-curing Suitable for screen printing Good heat and oil resistance	Red	1.35	21 000	480	24 h/mm 23 °C/50 %RH
ELASTOSIL® A 07	Amine-curing Solvent-borne Flowable	Translucent	1.02	9 000	10	24 h/mm 23 °C/50 %RH
ELASTOSIL® A 16	Amine-curing Suitable for screen printing Rapid curing in CO_2 atmosphere	Blue	1.90	30 000	5	24 h/mm 23 °C/50 %RH
ELASTOSIL® A 33	Amine-curing Non-sag	Beige	1.16	Non-sag	20	24 h/mm 23 °C/50 %RH
ELASTOSIL® A 95	Amine-curing Soft Good elongation	Gray	1.30	Non-sag	15	24 h/mm 23 °C/50 %RH
ELASTOSIL® A 234	Amine-curing Flowable UL 94 HB (150 °C)	White	1.21	35 000	20	24 h/mm 23 °C/50 %RH
ELASTOSIL® A 442	Amine-curing Soft Good elongation	Gray	1.39	Non-sag	4	24 h/mm 23 °C/50 %RH
ELASTOSIL® A 2000	Amine-curing Non-sag Good oil resistance	Red	1.52	Non-sag	10	24 h/mm 23 °C/50 %RH
ELASTOSIL® E 4	Acetic-curing Low compression set	Transparent	1.10	Non-sag	15	24 h/mm 23 °C/50 %RH
ELASTOSIL® E 10	Acetic-curing Excellent heat resistance Good mechanical properties	Red	1.10	10 000	15	24 h/mm 23 °C/50 %RH
ELASTOSIL® E 14	Acetic-curing Excellent heat resistance Good mechanical properties	Red	1.24	Non-sag	15	24 h/mm 23 °C/50 %RH
ELASTOSIL® E 41	Acetic-curing Flowable Solvent-borne	Transparent	1.09	65 000	20	24 h/mm 23 °C/50 %RH
ELASTOSIL® E 43	Acetic-curing Self-leveling	Black or transparent	1.09	350 000	15	24 h/mm 23 °C/50 %RH

These figures are intended as a guide and should not be used in preparing product specifications.
[1] Complies with the guaranteed minimum shelf life; generally the period between the manufacturing date and the best-use-before date is longer.

Hardness	Tensile strength	Elongation at break	CTE	Dielectric strength	Volume resistivity	Thermal conductivity	Shelf life [1]	Availability
	[MPa]	[%]	[m/mK]	[kV/mm]	[ohm cm]	[W/m K]	[Months]	
50	2.4	100	3E-04	n.a.	1E+14	0.20	12	U.S.
20	1.1	300	3E-04	15	1E+14	0.20	6	Yes
65	2.7	50	3E-04	n.a.	1E+14	0.20	12	U.S.
25	2.5	350	3E-04	17	1E+14	0.20	9	Yes
18	n.a.	n.a.	3E-04	n.a.	1E+14	0.20	6	U.S.
36	2.2	200	3E-04	23	1E+14	0.20	9	Yes
18	1.5	800	3E-04	n.a.	1E+14	0.20	12	U.S.
45	2.1	300	3E-04	n.a.	1E+14	0.20	12	U.S.
16	1.5	600	3E-04	21	1E+14	0.20	12	Yes
25	3	300	3E-04	21	1E+14	0.20	9	Yes
36	3	300	3E-04	21	1E+14	0.20	9	Yes
30	4.5	500	3E-04	21	1E+14	0.20	12	Yes
30	4.5	500	3E-04	21	1E+14	0.20	12	Yes

BONDING, FIXING, SEALING: PART 2.

Product	Properties	Color	Density	Viscosity	Pot life/ skin-over time	Curing time
1-Part Condensation-Curing RTV-1			[g/cm³]	[mPas]	[min]	
ELASTOSIL® E 50	Acetic-curing Flowable	Transparent	1.07	50 000	10	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 10	Oxime-curing Flowable	Transparent	1.07	10 000	20	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 189	Oxime curing Oil-resistant	Black	1.10	Non-sag	30	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 192	Oxime-curing	White, black or transparent	1.03	Non-sag	50	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 198	Oxime-curing Very good heat resistance	Gray or black	1.20	Non-sag	25	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 199	Oxime-curing Good mechanical properties	Transparent	1.10	Non-sag	40	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 2010	Alkoxy-curing Flowable	Transparent	1.01	10 000	20	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 2034	Alkoxy-curing Self-leveling	Gray	1.15	40 000	20	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 2170	Alkoxy-curing Soft	White, gray, black or transparent	1.03	Non-sag	15	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 2189	Alkoxy-curing Oil-resistant	Black	1.30	Non-sag	30	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 2197	Alkoxy-curing Very good heat resistance	Gray	1.26	Non-sag	25	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 2199	Alkoxy-curing Excellent adhesion	Transparent	1.05	Non-sag	20	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 9132	Alkoxy-curing Flame-retardant (UL 94 VO)	Gray or white	1.28	Non-sag	15	24 h/mm 23 °C/50 %RH
SEMICOSIL® 936 UV	Rapid UV curing Solvent-free Shadow curing	Translucent	1.00	8 000	120	24 h/mm 23 °C/50 %RH
SEMICOSIL® 975 TC	Alkoxy-curing Good thermal conductivity Reduced content of low-volatile siloxanes	Beige	1.85	Non-sag	5	24 h/mm 23 °C/50 %RH
SEMICOSIL® 979 EC	Amine-curing Electrically conductive	Black	0.92	Non-sag	10	24 h/mm 23 °C/50 %RH

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[1] Complies with the guaranteed minimum shelf life; generally the period between the manufacturing date and the best-use-before date is longer.

Hardness	Tensile strength	Elongation at break	CTE	Dielectric strength	Volume resistivity	Thermal conductivity	Shelf life[1]	Availability
	[MPa]	[%]	[m/mK]	[kV/mm]	[ohm cm]	[W/m K]	[Months]	
28	3.5	400	3E-04	21	1E+14	0.20	9	Yes
25	1.6	200	3E-04	21	1E+14	0.20	9	Yes
32	2	250	3E-04	21	1E+14	0.20	9	Yes
20	1.4	500	3E-04	21	1E+14	0.20	9	Yes
42	3	300	3E-04	21	1E+14	0.20	9	Yes
35	4	450	3E-04	21	1E+14	0.20	9	Yes
25	1	200	3E-04	21	1E+14	0.20	6	Yes
35	1.5	200	3E-04	21	1E+14	0.20	6	Yes
18	0.6	300	3E-04	21	1E+14	0.20	9	Yes
44	2.3	250	3E-04	21	1E+14	0.20	6	Yes
35	2.5	350	3E-04	21	1E+14	0.20	6	Yes
40	2.5	300	3E-04	21	1E+14	0.20	6	Yes
33	2.4	600	3E-04	21	1E+14	0.20	9	Yes
30	n.a.	n.a.	3E-04	n.a.	n.a.	0.20	6	U.S.
50	2.5	50	2E-04	n.a.	n.a.	0.80	6	On request
35	1.5	200	n.a.	n.a.	10	n.a.	12	U.S.

BONDING, FIXING, SEALING: PART 3.

Product	Properties	Color	Density	Viscosity	Pot life/ skin-over time	Curing time
2-Part Condensation-Curing			[g/cm³]	[mPas]	[min]	
ELASTOSIL® RT 771	Rapid curing at room temperature Suitable for FIPG applications	Gray	1.45	100 000	15	2 h/23 °C
ELASTOSIL® RT 772	Rapid curing at room temperature UL 94 HB (200 °C) Very good heat resistance	Gray	1.27	30 000	12	2 h/23 °C
ELASTOSIL® RT 774	Rapid curing at room temperature Suitable for FIPG applications	Black	1.35	Non-sag	30	2 h/23 °C
ELASTOSIL® RT 778	Rapid curing at room temperature Very good heat resistance	Black	1.30	Non-sag	6	1 h/23 °C
2-Part Addition-Curing						
ELASTOSIL® SC 870	Thixotropic foam Soft Rapid curing at room temperature	Gray	0.35	Non-sag	2	10 min/23 °C
1-Part Addition-Curing						
SEMICOSIL® 989/1K	Thermal curing Very good adhesion	Translucent	1.10	Non-sag	n.a.	1 h/130 °C 10 min/150 °C

These figures are intended as a guide and should not be used in preparing product specifications.
[1] Complies with the guaranteed minimum shelf life; generally the period between the manufacturing date and the best-use-before date is longer.

Hardness	Tensile strength	Elongation at break	CTE	Dielectric strength	Volume resistivity	Thermal conductivity	Shelf life[1]	Availability
	[MPa]	[%]	[m/mK]	[kV/mm]	[ohm cm]	[W/m K]	[Months]	
50	1.0	180	3E-04	23	1E+14	0.20	12	On request
35	2.1	250	3E-04	23	1E+14	0.20	12	On request
40	2.0	200	3E-04	23	1E+14	0.20	6	On request
50	3.5	200	3E-04	23	1E+14	0.20	12	On request
8	0.4	n.a	n.a	n.a	n.a	n.a	9	On request
55	5	200	3E-04	23	1E+14	0.20	6	On request

POTTING, EMBEDDING: PART 1.

Product	Properties	Color	Density	Viscosity	Mixing ratio	Pot life/ skin-over time	Curing time	Hardness Shore
2-Part Condensation-Curing			[g/cm³]	[mPas]				[mm/10]
ELASTOSIL® RT 563	General-use potting compound	Beige	1.27	3 500	100:4	40 min	24 h/23 °C	55
ELASTOSIL® RT K	General-use potting compound	Gray	1.22	7 000	100:4	150 min	7 h/23 °C	45
ELASTOSIL® RT 426	General-use potting compound	Reddish brown	1.44	10 000	100:4	60 min	24 h/23 °C	55
ELASTOSIL® RT 428	General-use potting compound	Reddish brown	1.53	10 000	100:4	60 min	24 h/23 °C	70
ELASTOSIL® RT 2100	Excellent heat resistance	Reddish brown	1.49	15 000	100:0.3	120 min	24 h/23 °C	60
2-Part Addition-Curing								
WACKER SilGel® 610	Very soft	Transparent	0.96	7 000	1:1	1 h	4 h/23 °C 5 min/120 °C	90 [4]
WACKER SilGel® 611 white	Distinct tackiness Good damping properties	White	0.96	1 000	1:1	50 min	6 h/23 °C 10 min/120 °C	30 [4]
WACKER SilGel® 612	Highly transparent Distinct tackiness Good damping properties	Transparent	0.96	1 000	1:1	2.5 h	8 h/23 °C 10 min/120 °C	75 [4]
WACKER SilGel® 612 EH	Transparent Rapid curing Good damping properties Low risk of inhibition	Brownish	0.96	1 000	1:1	30 min	2 h/23 °C 3 min/120 °C	30 [4]
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
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
ELASTOSIL® RT 604	Highly transparent	Transparent	0.96	800	9:1	90 min	24 h/23 °C 8 min/100 °C	25
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
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
ELASTOSIL® RT 624	Potting compound Suitable for injection molding	Translucent	1.05	50 000	1:1	24 h	24 h/23 °C 10 min/100 °C	40
ELASTOSIL® RT 625	General-use potting compound Suitable for the manufacture of technical molded parts Excellent mechanical properties	Translucent	1.10	35 000	9:1	60 min	24 h/23 °C 10 min/100 °C	25

These figures are intended as a guide and should not be used in preparing product specifications.
[1] Complies with the guaranteed minimum shelf life; generally the period between the manufacturing date and the best-use-before date is longer.

Tensile strength	Elongation at break	Tear strength	CTE	Dielectric strength	Dielectric constant	Dissipation factor	Volume resistivity	CTI	Thermal conductivity	Shelf life[1]	Availa-bility
[N/mm²]	[%]	[N/mm]	[m/mK]	[kV/mm]	[ε]		[ohm cm]	CTI	[W/m K]	[Months]	
4.5	120	3.0	3E-04	23	2.8	8E-03	6E+13	>600	0.3	12	Yes
2.0	130		3E-04	23	3.3	3E-02	1E+14	>600	0.3	12	Yes
4.5	120	5.5	3E-04	23	3.7	2E-02	1E+14	>600	0.3	12	Yes
6.0	90	5.0	3E-04	23	3.5	2E-02	1E+13	>600	0.3	12	Yes
5.2	130	4.4	3E-04	20	4.0	7E-03	1E+15	>600	0.3	12	U.S.
n.a.	n.a.	n.a.	3E-04	23	2.8	1E-03	1E+16		0.2	12	On request
n.a.	n.a.	n.a.	3E-04	23	2.8	1E-03	1E+16		0.2	12	On request
n.a.	n.a.	n.a.	3E-04	23	2.7	1E-03	1E+16		0.2	12	Yes
n.a.	n.a.	n.a.	3E-04	23	2.8	1E-03	1E+16		0.2	12	On request
7.0	100	3.0	3E-04	23	2.8	1E-03	1E+15	>600	0.2	12	Yes
1.5	130	n.a.	3E-04	23	3.1	5E-02	1E+15	>600	0.2	12	Yes
n.a.	n.a.	n.a.	3E-04	23	2.7	2E-03	1E+15	>600	0.2	12	Yes
3.5	100	4.0	3E-04	23	3.7	4E-02	1E+15	>600	0.4	12	Yes
6.5	550	30.0	3E-04	23	3.2	5E-03	1E+15	>600	0.2	12	Yes
5.0	300	12.0	3E-04	23	3.2	5E-03	1E+15	>600	0.2	12	Yes
6.5	600	30.0	3E-04	23	3.2	5E-03	1E+15	>600	0.2	12	Yes

POTTING, EMBEDDING: PART 2.

Product	Properties	Color	Density	Viscosity	Mixing ratio	Pot life/ skin-over time	Curing time	Hardness Shore
2-Part Addition-Curing			[g/cm³]	[mPas]				[mm/10]
ELASTOSIL® RT 628	Suitable for the manufacture of technical molded parts Good mechanical properties	Gray	1.23	40 000	9:1	70 min	24 h/23 °C 10 min/100 °C	50
ELASTOSIL® RT 675	Very high thermal conductivity	Reddish brown	2.30	35 000	1:1	150 min	60 min/70 °C 10 min/150 °C	80
ELASTOSIL® RT 743LV	Heat-curing Very low viscosity Reduced content of low-volatile siloxanes	Gray	1.45	1 300	1:1	8 h	60 min/120 °C 20 min/150 °C	20
ELASTOSIL® RT 743LV-K	Heat-curing Very low viscosity Reduced content of low-volatile siloxanes Low risk of inhibition	Gray	1.45	1 300	1:1	4 h	40 min/120 °C 10 min/150 °C	20
2-Part Addition-Curing, Self-Adhesive								
ELASTOSIL® RT 615	Low viscosity Low risk of inhibition	Brownish	0.96	1 000	1:1	8 h	60 min/70 °C 10 min/150 °C	15
ELASTOSIL® RT 741	Thermal curing Medium hardness	Gray	1.35	1 000	1:1	24 h	60 min/100 °C 15 min/150 °C	45
ELASTOSIL® RT 745	Low viscosity Low hardness	Brownish	0.96	1 000	1:1	8 h	60 min/80 °C 10 min/120 °C	15
ELASTOSIL® RT 745"S"	Low viscosity Very low hardness	Brownish	0.96	1 000	1:1	8 h	60 min/80 °C 10 min/120 °C	5
SEMICOSIL® 205	Thermal curing Flame-retardant (UL 94 VO)	Gray	1.35	1 800	1:1	2 h	15 min/100 °C	10

These figures are intended as a guide and should not be used in preparing product specifications.
[1] Complies with the guaranteed minimum shelf life; generally the period between the manufacturing date and the best-use-before date is longer.

Tensile strength	Elongation at break	Tear strength	CTE	Dielectric strength	Dielectric constant	Dissipation factor	Volume resistivity	CTI	Thermal conductivity	Shelf life[1]	Availa-bility
[N/mm²]	[%]	[N/mm]	[m/mK]	[kV/mm]	[ε]		[ohm cm]	CTI	[W/m K]	[Months]	
3.5	230	11.0	3E-04	23	3.2	6E-03	1E+15	>600	0.3	12	Yes
2.0	50	8.0	2E-04	23	6.1	2E-02	1E+15	>600	1.1	12	Yes
1.5	160	2.5	3E-04	23	3.1	1E-02	1E+14	>600	0.5	9	Yes
1.5	160	2.5	3E-04	23	3.1	1E-02	1E+14	>600	0.5	9	Yes
0.3	200	n.a.	3E-04	23	2.8	3E-04	1E+15	>600	0.2	12	Yes
n.a.	n.a.	n.a.	3E-04	23	3.7	3E-02	1E+14	>600	0.3	12	Yes
0.3	200	n.a.	3E-04	23	2.9	4E-03	1E+15	>600	0.2	12	Yes
0.3	650	n.a.	3E-04	23	2.9	4E-03	1E+15	>600	0.2	12	Yes
0.7	180	1.8	3E-04	16	2.9	2E-03	1E+15	>600	0.3	12	U.S.

COATING, VARNISHING.

Product	Properties	Color	Density	Viscosity	Mixing ratio	Pot life/ skin-over time	Curing time
Conformal Coating, 1-Part Condensation-Curing RTV-1			[g/cm³]	[mPas]			
ELASTOSIL® A07	Solvent-borne Amine-curing Flowable	Translucent	1.02	9 000	n.a.	20 min	24 h/mm 23 °C/50 %RH
ELASTOSIL® E 60	Acetic-curing Flowable Very good heat resistance	Red	1.12	70 000	n.a.	15 min	12 h/mm 23 °C/50 %RH
ELASTOSIL® N 10	Oxime-curing Ready-to-use	Transparent	1.07	10 000	n.a.	20 min	24 h/mm 23 °C/50 %RH
ELASTOSIL® N 2010	Alkoxy-curing Flowable Ready-to-use	Transparent	1.01	12 000	n.a.	20 min	24 h/mm 23 °C/50 %RH
SEMICOSIL® 936 UV	Amine-curing Rapid UV curing Solvent-free Shadow curing	Translucent	1.00	8 000	n.a.	120 min	UV curing 1 mil/15 sec
SEMICOSIL® 964	Amine-curing 100 % solids content Rapid curing in CO_2/H_2O atmosphere Flame-retardant (UL 94 VO)	Bluish	1.00	800	n.a.	20 min	5 mil: 20 min 25 °C/50 % RH
SEMICOSIL® 964 UV/Clear	Amine-curing 100 % solids content Rapid UV curing	Transparent	1.00	800	n.a.	20 min	UV curing 1 mil/75 sec
SEMICOSIL® 960 Clear	Ready-to-use Amine-curing Rapid curing Self-adhesive	Transparent	0.93	4 000	n.a.	20 min	5 mil: 20 min 25 °C/50 % RH
SEMICOSIL® 960 Red	Ready-to-use Amine-curing Rapid curing Self-adhesive	Red	0.93	4 000	n.a.	20 min	5 mil: 20 min 25 °C/50 % RH
Conformal Coating, 2-Part Addition-Curing							
ELASTOSIL® RT 745	Low hardness Low viscosity Self-adhesive	Brownish	0.98	1 000	1:1	8 h	60 min/80 °C 10 min/120 °C
ELASTOSIL® RT 745"S"	Low hardness Low viscosity Self-adhesive	Brownish	0.98	1 000	1:1	8 h	60 min/80 °C 10 min/120 °C

These figures are intended as a guide and should not be used in preparing product specifications.
[1] Complies with the guaranteed minimum shelf life; generally the period between the manufacturing date and the best-use-before date is longer.

Hardness	CTE	Dielectric strength	Dielectric constant	Dissipation factor	Volume resistivity	Thermal conductivity	Shelf life[1]	Availability
[Shore]	[m/mK]	[kV/mm]	[ε]		[ohm cm]	[W/m K]	[Months]	
20	3E-04	15	2.9	4E-03	1E+15	0.2	6	Yes
32	3E-04	n.a.	n.a.	n.a.	n.a.	0.2	9	Yes
25	3E-04	21	n.a.	n.a.	1E+14	0.2	9	Yes
25	3E-04	21	n.a.	n.a.	1E+14	0.2	9	Yes
30	3E-04	n.a.	n.a.	n.a.	n.a.	0.2	6	U.S.
27	3E-04	20	2.6	n.a.	1E+15	0.2	12	U.S.
27	3E-04	20	2.6	n.a.	1E+15	0.2	12	U.S.
25	3E-04	18	2.7	n.a.	1E+15	0.2	12	U.S.
25	3E-04	18	2.7	n.a.	1E+15	0.2	12	U.S.
15	3E-04	23	2.8	1E-03	1E+15	0.2	12	Yes
5	3E-04	23	2.8	1E-03	1E+15	0.2	12	Yes

NOTES

WACKER AT A GLANCE

WACKER
is a technological leader in the chemical and electrochemical industries and a worldwide innovation partner to customers in many key global sectors. With around 14,400 employees, WACKER generated sales of EUR 2.76 billion in 2005. Germany accounted for 21 % of sales, Europe (excluding Germany) for 31 %, the Americas for 22 % and Asia-Pacific, including the rest of the world, for 26 %. Headquartered in Munich, Germany, WACKER has some 20 production sites worldwide and a global network of over 100 sales offices.
With R&D spending at 5.3 % of sales in 2005, WACKER is among the world's most research-intensive chemical companies.

WACKER SILICONES
is a leading supplier of complete silicone-based solutions that comprise products, services and conceptual approaches. As a provider of solutions, the business division helps customers press ahead with innovations, exploit global markets fully, and optimize business processes to reduce overall costs and boost productivity. Silicones are the basis for products offering highly diverse properties for virtually unlimited fields of application, ranging from the automotive, construction, chemical, electrical engineering and electronics industries, through pulp and paper, cosmetics, consumer care and textiles, to mechanical engineering and metal processing.

WACKER POLYMERS
is the global leader for high-quality binders and polymer additives. This business division's activities encompass construction chemicals and functional polymers for lacquers, surface coatings and other industrial applications, as well as basic chemicals, i. e. acetyls. Products such as dispersible polymer powders, dispersions, solid resins, powder binders and surface coating resins from WACKER POLYMERS are used in the construction, automotive, paper and adhesives industries, as well as by manufacturers of printing inks and industrial coatings.

WACKER FINE CHEMICALS
is an expert in organic synthesis, silane chemistry and biotechnology, providing tailored solutions for its customers in the life sciences and consumer care industries. The range of innovative products includes complex organic intermediates, organosilanes, chiral products, cyclodextrins and amino acids. With its comprehensive expertise, WACKER FINE CHEMICALS is a preferred partner for highly challenging custom-manufacturing projects in the fields of chemistry and biotechnology.

WACKER POLYSILICON
has been producing hyperpure silicon for the semiconductor and photovoltaics industries for over 50 years. As one of the largest global manufacturers of polycrystalline silicon, WACKER POLYSILICON supplies leading wafer and solar-cell manufacturers.

Siltronic
is one of the world's leading producers of hyperpure silicon wafers, supplying many major chip manufacturers. Siltronic develops and produces wafers up to 300 mm in diameter at facilities in Europe, the USA, Asia and Japan. Silicon wafers form the basis of state-of-the-art micro and nanoelectronics used, for example, in computers, telecommunications, motor vehicles, medical technology, consumer electronics and control systems.

06.06

WACKER

The data presented in this brochure are in accordance with the present state of our knowledge, but do not absolve the user from carefully checking all supplies immediately upon receipt. We reserve the right to alter product constants within the scope of technical progress or new developments. The information given in this brochure should be checked by preliminary trials because of conditions during processing over which we have no control, especially where other companies' raw materials are also being used. The information provided by us does not absolve the user from the obligation of investigating the possibility of infringement of third parties' rights and, if necessary, clarifying the position. Recommendations for use do not constitute a warranty, either express or implied, of the fitness or suitability of the product for a particular purpose.

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WACKER SILICONES

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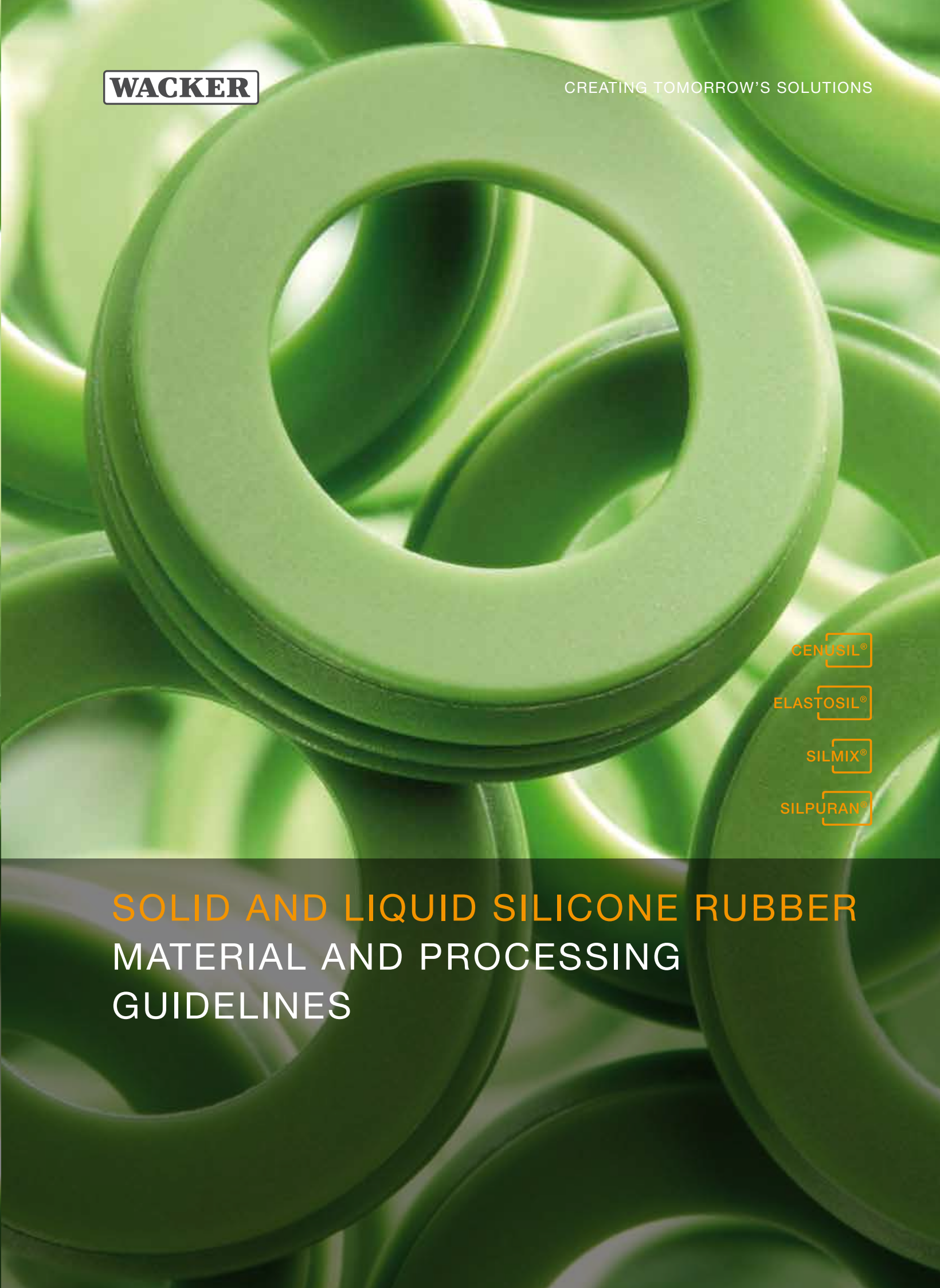
WACKER

CREATING TOMORROW'S SOLUTIONS



CENUSIL®

ELASTOSIL®

SILMIX®

SILPURAN®

SOLID AND LIQUID SILICONE RUBBER
MATERIAL AND PROCESSING GUIDELINES

WELCOME TO THE WORLD OF SILICONE RUBBER

Contents

WACKER Production Sites for Silicone Rubber

Burghausen (Germany):
Production and technical center
Nünchritz (Germany): Production
Pilsen (Czech Republic): Production
Adrian, USA: Production and technical center
Chino (USA): Production
North Canton (USA): Production
Zhangjiagang (China):
Production and technical center
Akeno-Tsukuba (Japan):
Production and technical center
Jandira (Brazil): Technical center
Mumbai, India: Technical center
Amtala, India: Production

WACKER is one of the world's three biggest silicone manufacturers. For over 50 years, we have been developing, refining and producing silicones for a huge variety of applications.

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.

Close on 100 Years of Experience – Close on 100 Years of Innovation

WACKER is one of the most research-intensive companies in the industry. We maintain our own basic-research institute as well as industry-oriented innovation teams in close contact with universities. This enables us to offer you ever more refined solutions.

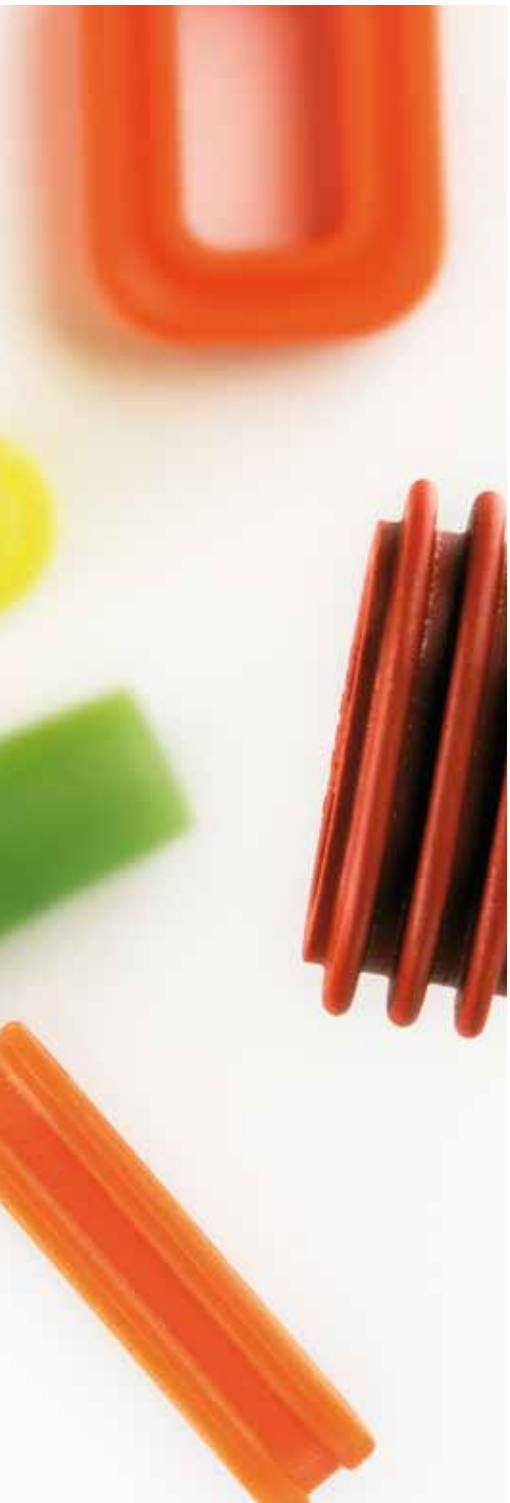
Silicone Rubber – 1,000 and More Grades

Silicones can be tailored to practically any application. Accordingly, we have a very wide and deep product range. Your choice of product depends on processing parameters and the properties required for the cured rubber product. Our experts will gladly assist you in choosing the right silicone grade.

Orientation at the Click of a Mouse

The enclosed CD-ROM contains a product selector to help you make a quick preliminary choice. It also contains detailed product information and a list of WACKER contact partners. Worldwide.

SECTION 1:
SILICONE RUBBER – BASIC PRINCIPLES

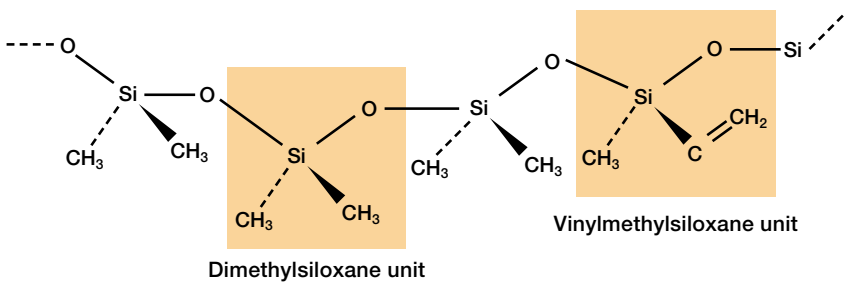


Contents

General characteristics of silicones and why WACKER silicones are so successful

1.1
CHEMICAL STRUCTURE

Chemical Structure



From Sand to Silicone

Silicones are made from quartz sand, a raw material available in practically unlimited quantities. WACKER manufactures silicone monomers in a closed-loop integrated production system based on the Müller-Rochow process, creating the precursors for around 3,000 silicone products.

Sustainable Production

The highly integrated energy and raw-material production system is exclusive to WACKER. The by-products of the chemical processes are either used immediately or returned elsewhere to the production loop, so that virtually no waste is generated. Waste heat is also recovered and utilized, increasing the system's overall energy efficiency.

Uncured silicone rubber contains polymers of different chain lengths. It always comprises a principal silicon-oxygen chain (the siloxane backbone) and an organic moiety bound to the silicon. A silicon atom has four valence electrons, which is why silicone rubber is often abbreviated with a Q for “quaternary group”. The properties of silicone rubber vary greatly depending on the organic groups and the chemical structure.

The organic groups may be methyl, vinyl, phenyl or other groups. Depending on which organic groups are present, silicone polymers in common use are classified as follows:

MQ
MQ, or polydimethylsiloxane (PDMS), denotes a polymer in which two methyl groups are bound to the siloxane backbone.

VMQ
VMQ stands for a polydimethylsiloxane in which a small number of methyl groups have been replaced by vinyl groups.

PVMQ
PVMQ stands for an VMQ in which a small number of methyl groups have been replaced by phenyl groups.

FVMQ
FVMQ stands for an VMQ in which a small number of methyl groups have been replaced by trifluoropropyl substituents.

1.2
MAJOR CLASSES

Solid silicone rubber bar
(standard supply form)

Drum pair of liquid silicone rubber
(A and B component)

Aside from polymer structure, the viscosity frequently serves as a classification feature. A distinction is accordingly made between liquid and solid silicone rubber.

Solid Silicone Rubber

Solid silicone rubber contains polymers with a high molecular weight and relatively long polymer chains. It is referred to as HTV (= high-temperature-vulcanizing). WACKER offers two product ranges based on solid silicone rubber: a range of peroxide-curing grades marketed as ELASTOSIL® R (R = Rubber) and a range of addition-curing (platinum-catalyzed) grades marketed as ELASTOSIL® R *plus*.
The standard delivery form is as bars measuring 90 x 100 mm (cross-section), which are wrapped in PE film and shipped in cartons. For special requirements, we also offer our ready-to-use blends in the form of strips, round-cords, pellets and profile strips.

Liquid Silicone Rubber

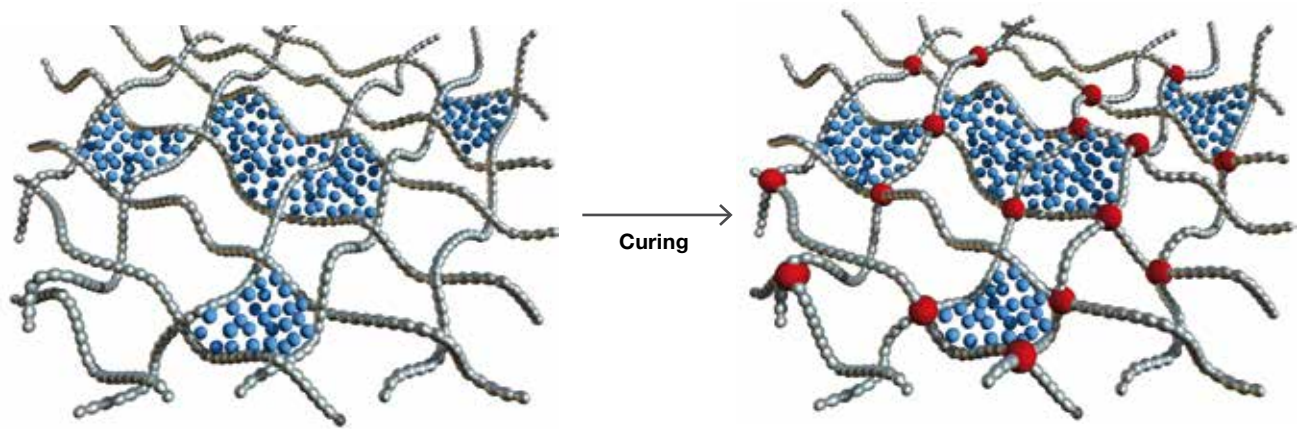
Liquid silicone rubber contains polymers of lower molecular weight and hence shorter chains. It has better flow properties. Liquid silicone rubber is always addition-curing (platinum-catalyzed), and is marketed by WACKER as ELASTOSIL® LR (LR = Liquid Rubber).
The A[1] and B[2] components are supplied in 20-kg or 200-kg containers:

- 20-kg pails with a PE inliner (ø inside 280 mm)
- 200-kg drums with a PE inliner (ø inside 571.5 mm)

[1] Contains platinum catalyst.
[2] Contains crosslinker.

1.3
COMPONENTS

Uncured, Filled Polymer Compared with Cured Rubber



Uncured polymer with filler

Polymer with chemical crosslinks (red) forms a filled, elastic network

Aside from the “pure polymer”, uncured silicone rubber generally contains only three additional substances: crosslinker, fillers and additives.

Crosslinkers

A crosslinker is required to convert the raw rubber into a mechanically stable cured product. Use is made of peroxides or platinum catalyst systems (see section 4.3, pages 36 and 37).

Fillers

Fillers are needed to reinforce the elastic silicone network. The nature, composition and quantity of the fillers have a crucial influence on the properties of the raw and cured rubber.

- Reinforcing fillers:
  Pyrogenic silica with very high BET surface areas (more than 100 m^2/g) is the most frequently used reinforcing filler. WACKER HDK® has proven to be especially effective here, although precipitated silica and carbon black can also be used.
- Non-reinforcing fillers:
  These have merely a fill-up function. Quartz, for example, increases the cured rubber's resistance to various media.

ELASTOSIL® pigment pastes blend especially easily and fast into rubber compounds on the roll mill

Additives

Compared with other elastomers, silicone rubber requires few additives because the essential properties are determined by the siloxane polymer used. Thus, a finished polymer compound may consist only of polymer and filler. Particularly notable is the fact that silicone rubber is free of curing accelerators or retarders, organic plasticizers and organic antioxidants. Additives include stabilizers, masticating aids and colorants.

Stabilizers

Stabilizers are available for special applications in order to optimize properties such as heat and media resistance.

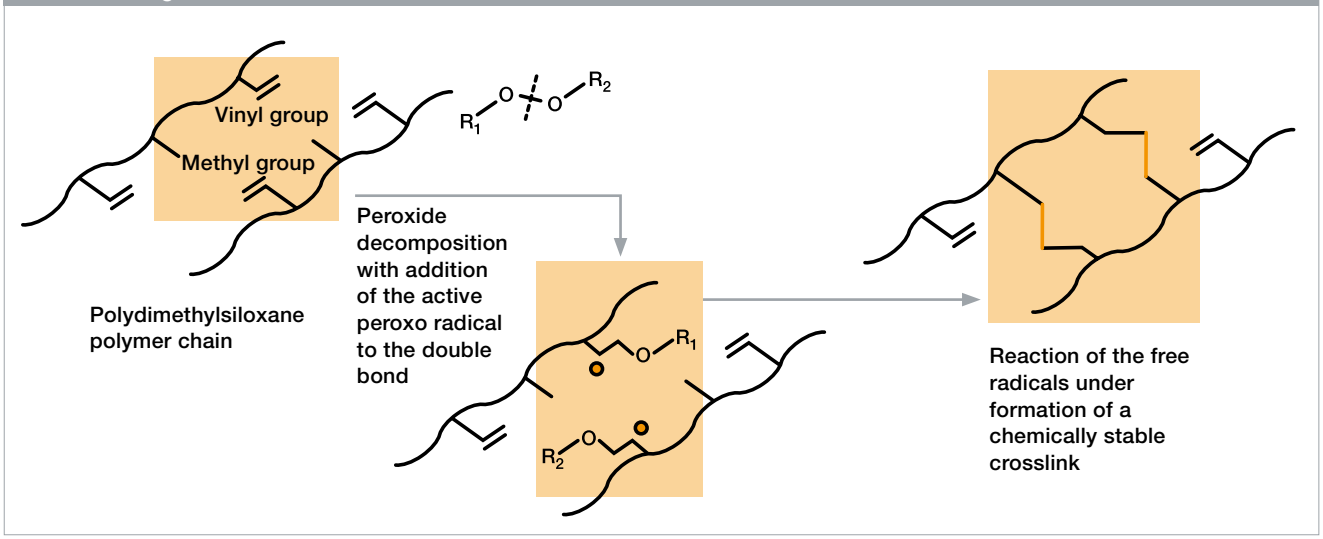
Colorants

Silicone rubber is generally transparent and can be colored as desired: from transparent through translucent to opaque. WACKER will supply you with suitable pigment pastes, both for liquid silicone rubber and solid silicone rubber. These pigment pastes are tailored specifically to the rubber grade in question and are easily blended into the compound while on the roll mill or via metering equipment during injection molding. It should be remembered that some additives are themselves inherently colored.

You will find additional information on fillers, additives, stabilizers and colorants in section 4.3, as from page 31.

1.4
CURING
PEROXIDE CURING

Peroxide Curing



To become an elastomeric material, raw silicone rubber has always to be cured. This can be done either by peroxide or addition curing.

Peroxide curing involves the use of organic peroxides. At elevated temperatures, they decompose to form highly reactive radicals which chemically crosslink the polymer chains. The result is a highly elastic, three-dimensional network. WACKER offers peroxide crosslinkers in paste or powder form.

Advantages

Peroxide curing is a time-tested and technically mature process. Peroxide-curing silicone rubber from WACKER has been in use for more than 50 years and is refined continuously in close cooperation with our customers. The same applies to the production processes, which ensure consistently high quality.
The rubber compounds are characterized by low sensitivity to catalyst poisons and have a particularly long shelf life.

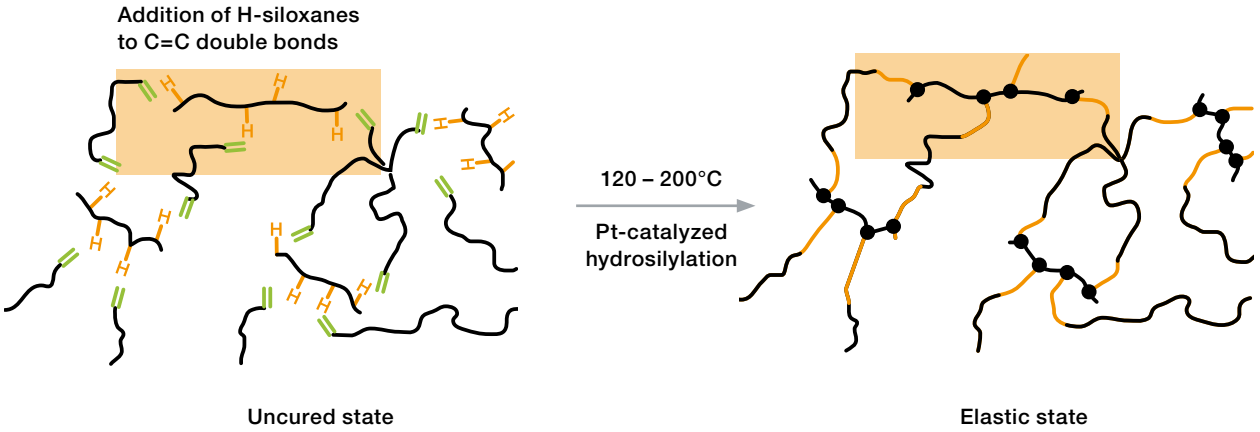
Processing Information

Some peroxide crosslinkers (ELASTOSIL® AUX Crosslinker C1 and ELASTOSIL® AUX Crosslinker C6) are inhibited by atmospheric oxygen. Any surface coming into contact with air during curing will cure incompletely and remain sticky.

You will find additional information on the various crosslinkers in section 4.3, page 36.

1.4 CURING PLATINUM-CATALYZED ADDITION CURING

Addition Curing



During platinum-catalyzed addition curing, the crosslinker's Si-H groups react with the vinyl groups of the polymer to form a three-dimensional network. WACKER offers silicone rubber grades which already contain the platinum catalyst as well as grades to which the catalyst must be added prior to use.

Advantages

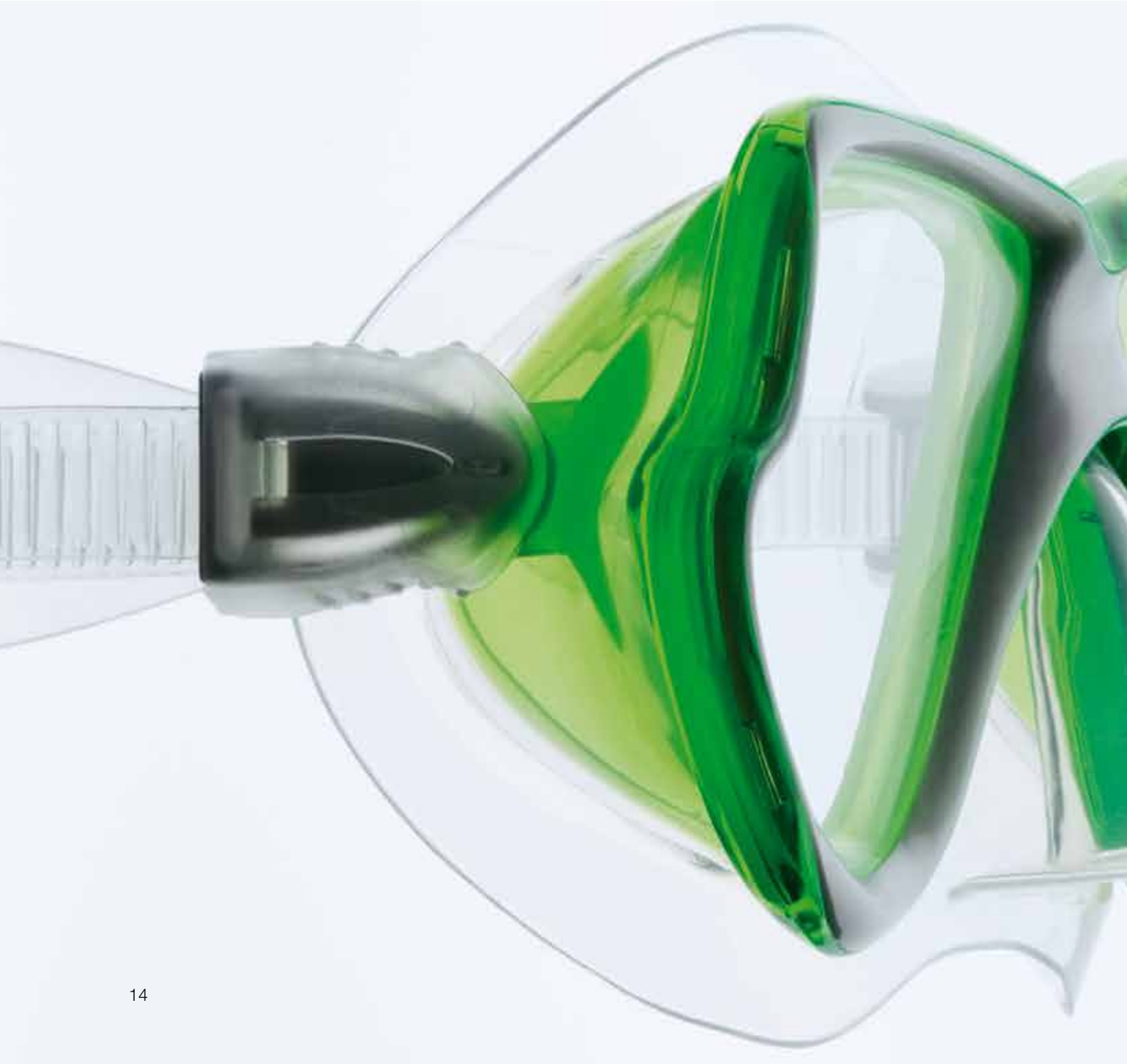
Unlike peroxide-curing, platinum-catalyzed addition reactions do not produce odor- or flavor-impairing by-products. This is a major advantage for food-contact applications. A further benefit is that colors are not affected by thermal post-curing. Curing is fast, and the curing speed can be controlled via the temperature. The cured rubber demolds very easily and has a dry surface, thus facilitating further processing and reducing production cycle times.

Processing Information

Even small amounts of catalyst poisons in the ambient air can inhibit the catalyst, especially amine- and sulfur-containing compounds of the kind encountered during processing of organic rubber grades. For this reason, platinum-catalyzed systems must be stored and processed in a separate room, well away from organic rubber. Roll mills and processing machinery must always be scrupulously cleaned in order to prevent cross-contamination.

You will find additional processing information in section 5, page 39.

SECTION 2:
SILICONE RUBBER – MATERIAL AND PROCESSING ADVANTAGES



Contents

Why and when ELASTOSIL® silicone rubber is the material of choice

2.1
MATERIAL ADVANTAGES
INHERENT PROPERTIES

ELASTOSIL® silicone rubber is flame resistant and flame retardant. Clothing made of silicone-coated fabric provides vital protection for rescue personnel in action

SILPURAN® silicone rubber is highly transparent, chemically inert, does not contain organic plasticizers and therefore complies with medical standards

ELASTOSIL® silicone rubber is extremely heat resistant, odorless, tasteless and permanently elastic, making it predestined for seals and gaskets

Silicone rubber differs from other elastomers in its unparalleled property range. Of particular interest are the characteristics resulting not from additives or surface treatment but from the polymer and filler structure. These are inherent properties of the rubber.

Material Benefits Resulting from the Polymer Structure

Silicones are characterized by a fully saturated backbone of alternating silicon and oxygen atoms. The Si-O links in the chain have an exceptionally high bond energy of 451 kJ/mol. C-C links, by comparison, have a bond energy of 352 kJ/mol. At the same time, the Si-O chain mobility is very high. The organic side groups shield the backbone, so surface energy is low.

This results in the following properties:

- Excellent high-temperature resistance combined with low-temperature flexibility
- High resistance to chemicals and environmental influences
- Water repellent surface

2.1
MATERIAL ADVANTAGES
GENERAL PROPERTIES

ELASTOSIL® silicone rubber withstands continuous high temperatures and dynamic stress, and thus represents the perfect solution for turbocharger hoses

All ELASTOSIL® silicone rubber grades have good mechanical properties. Specialty grades have very high tear resistance, making them ideal for bottle nipples and pacifiers

ELASTOSIL® silicone rubber has good release properties. Since it is odorless and tasteless, it is suitable for the manufacture of baking liners or molds

Material Benefits Resulting from the Polymer/Filler Structure

Silicone rubber usually contains pyrogenic silica as filler, e.g. HDK® from WACKER. Pyrogenic silica is structurally very similar to the polymer. They both consist predominantly of Si and O which leads to very interesting properties:

- High transparency
- Good mechanical properties thanks to effective polymer-filler interaction
- Good flame resistance; non-toxic combustion products in the case of fire

General Properties of Silicone Rubber

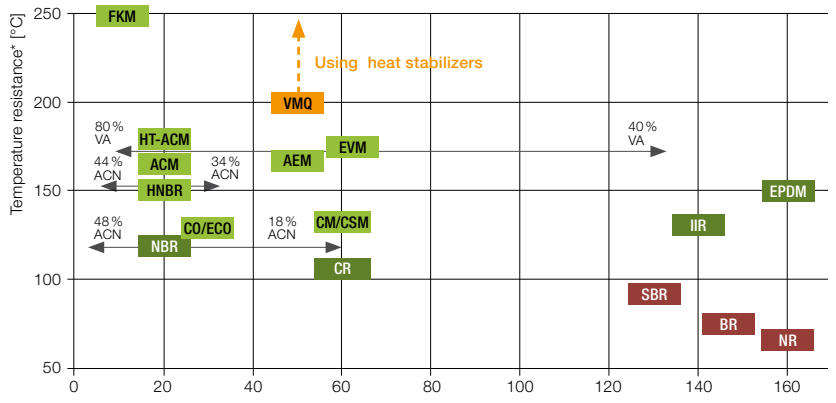
- Broad operating-temperature range from –50 °C to +250 °C, (specialty grades: –110 °C to +300 °C)
- Only slight changes in physical properties between –50 and +180 °C
- Excellent compression set
- Odorless and tasteless (many grades are BfR and FDA compliant)
- Can be pigmented as desired
- Can be easily processed
- Can be adjusted electrically from insulating to semiconducting
- High radiation resistance

Typical Range of Mechanical Properties

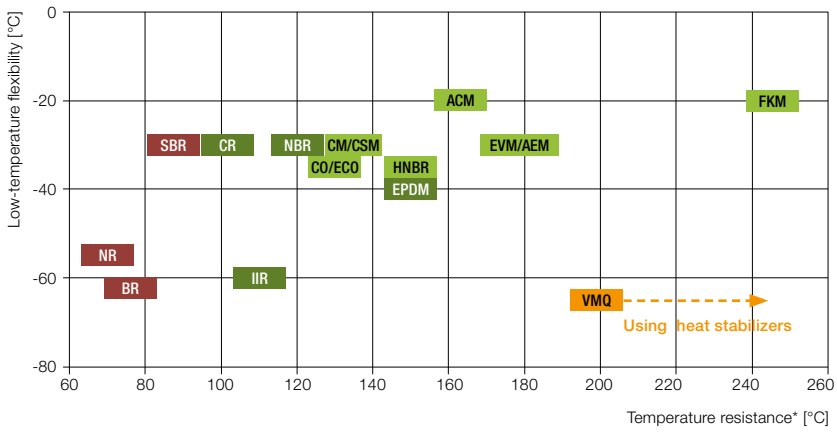
- Density 1.05 – 1.60 g/cm^3
- Shore A hardness 3 – 90
- Tensile strength 5 – 11 N/mm^2
- Elongation at break 100 – 1,100%
- Tear strength (ASTM D 624) 5 – 55 N/mm
- Compression set (22 h /175 °C) 5 – 25%
- Rebound resilience 30 – 70%

2.1
MATERIAL ADVANTAGES

Temperature and Oil Resistance (as per ASTM-D 2000/SAE J 200)



Low-Temperature Flexibility versus High-Temperature Resistance



* Temperature at which – after 1000 h – half of the initial elongation at break remains.

Exceptional Property Profile

Elastomers are generally expected to be heat resistant, oil resistant and flexible at low temperatures. Outstanding performance in any of these properties is likely to come at the expense of the other ones. Silicone rubber is an exception here: it shows excellent mechanical properties over a very wide temperature range and exhibits satisfactory resistance to oil. Silicones also have an outstanding low compression set.

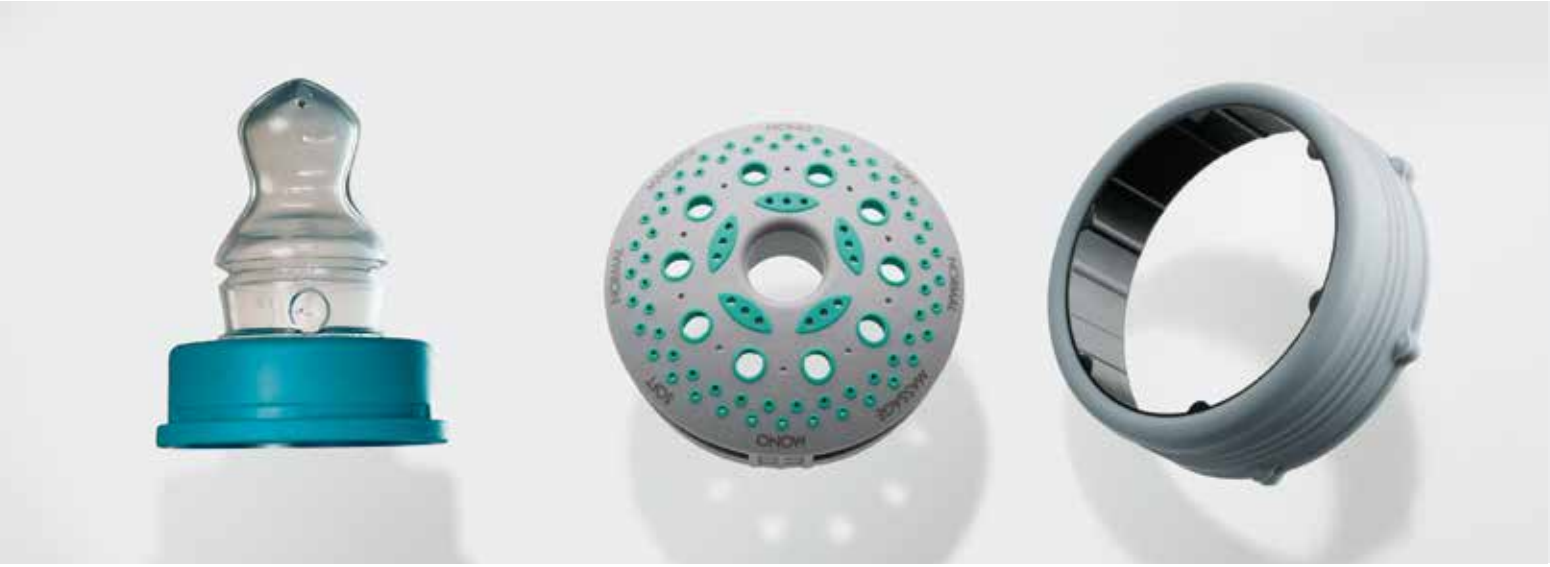
High Purity

Compared to other elastomers, silicone rubber is exceptionally pure and is therefore also suitable for use in the food and medical sectors.

Ready-to-use Compounds

Silicone rubber is available as ready-to-use compounds or as compounds to which the crosslinker and, if required, pigment, must be added.

2.2
PROCESSING ADVANTAGES



ELASTOSIL® liquid silicone rubber permits mass production of parts without secondary finishing

Self-adhesive ELASTOSIL® silicone rubber grades permit the production of composite materials in a single operation

Besides curing properties, the processing properties also represent a major criterion for the choice of a suitable elastomer. Liquid and solid silicones each have a large number of processing advantages:

Advantages of Solid Silicone Rubber

- Processing is highly variable, so that, e. g. a wide range of different parts can be made with a few basic silicone grades
- High flexibility for small-to-medium series

Processes:

- Press curing, injection molding
- Extrusion
- Calendering

Advantages of Liquid Silicone Rubber

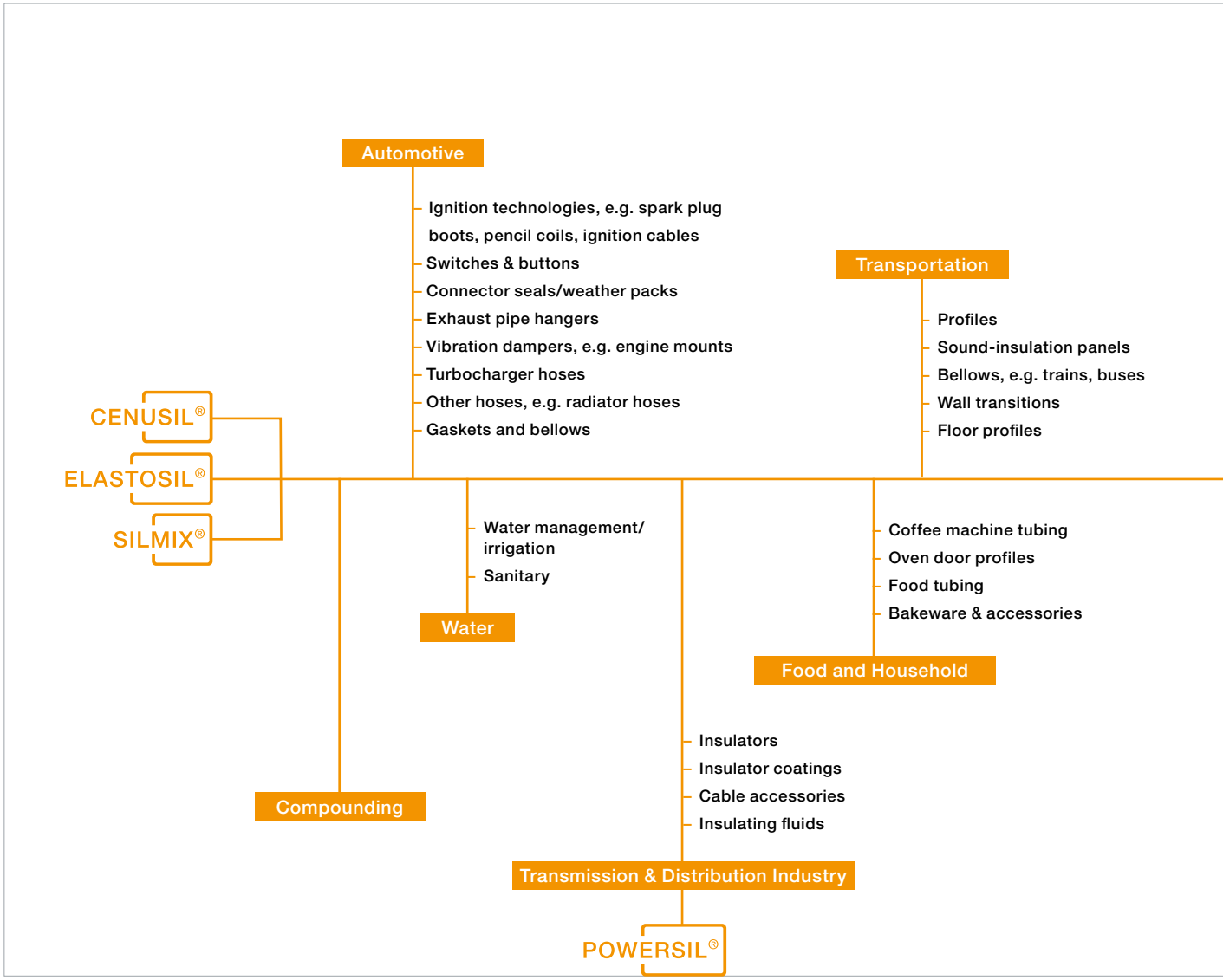
- Short cycle times (low viscosity, high curing speed)
- Process can be fully automated
- Molds with up to 256 cavities
- Suitable for complex part geometry
- 2K injection molding
- No secondary finishing

SECTION 3:
WACKER SILICONE RUBBER GRADES

Contents

Which applications and properties are typical?

3.1
IMPORTANT APPLICATIONS OF SILICONE RUBBER



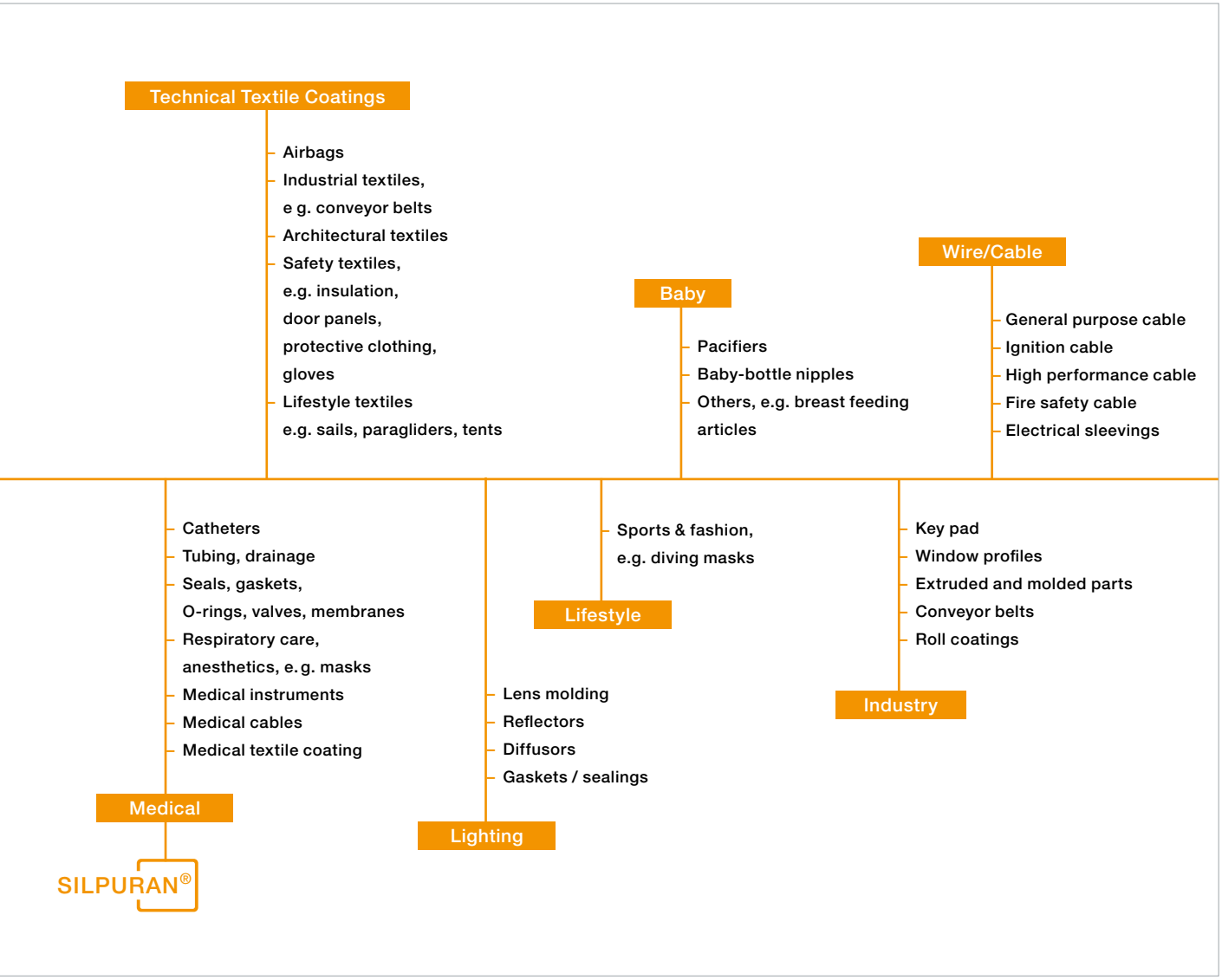
Please also see our applications-specific brochures on medical technology, SILPURAN®, automotive, cables and textile coatings.

Looking for a Specific Product?

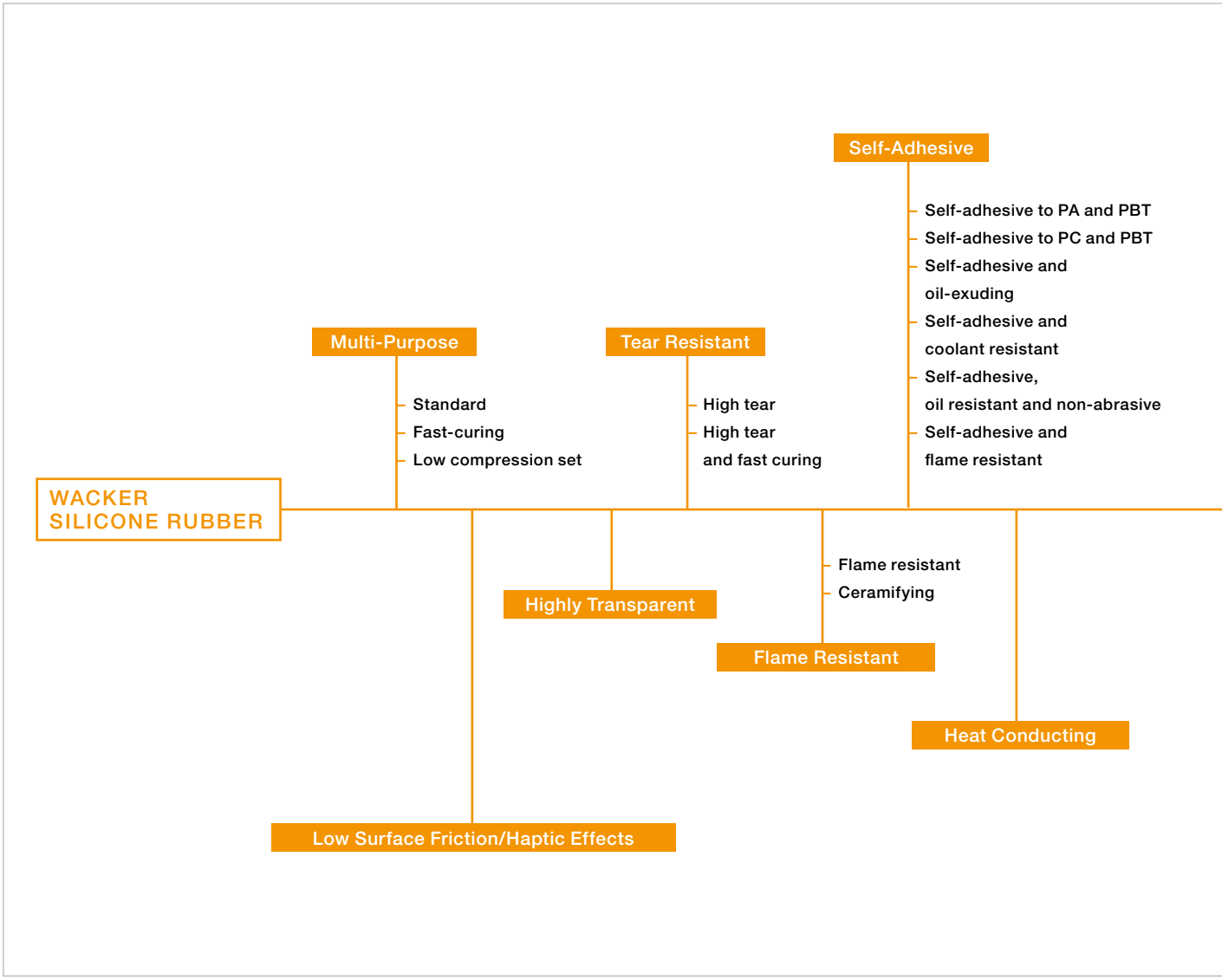
The electronic product selector gives you a quick overview. The most important products are also listed in the product overviews.

Your Application is not Listed?

Why not give us a call? Our specialists will quickly tell you whether a particular silicone rubber is the right material for you.



3.2
PROPERTIES OF SILICONE RUBBER



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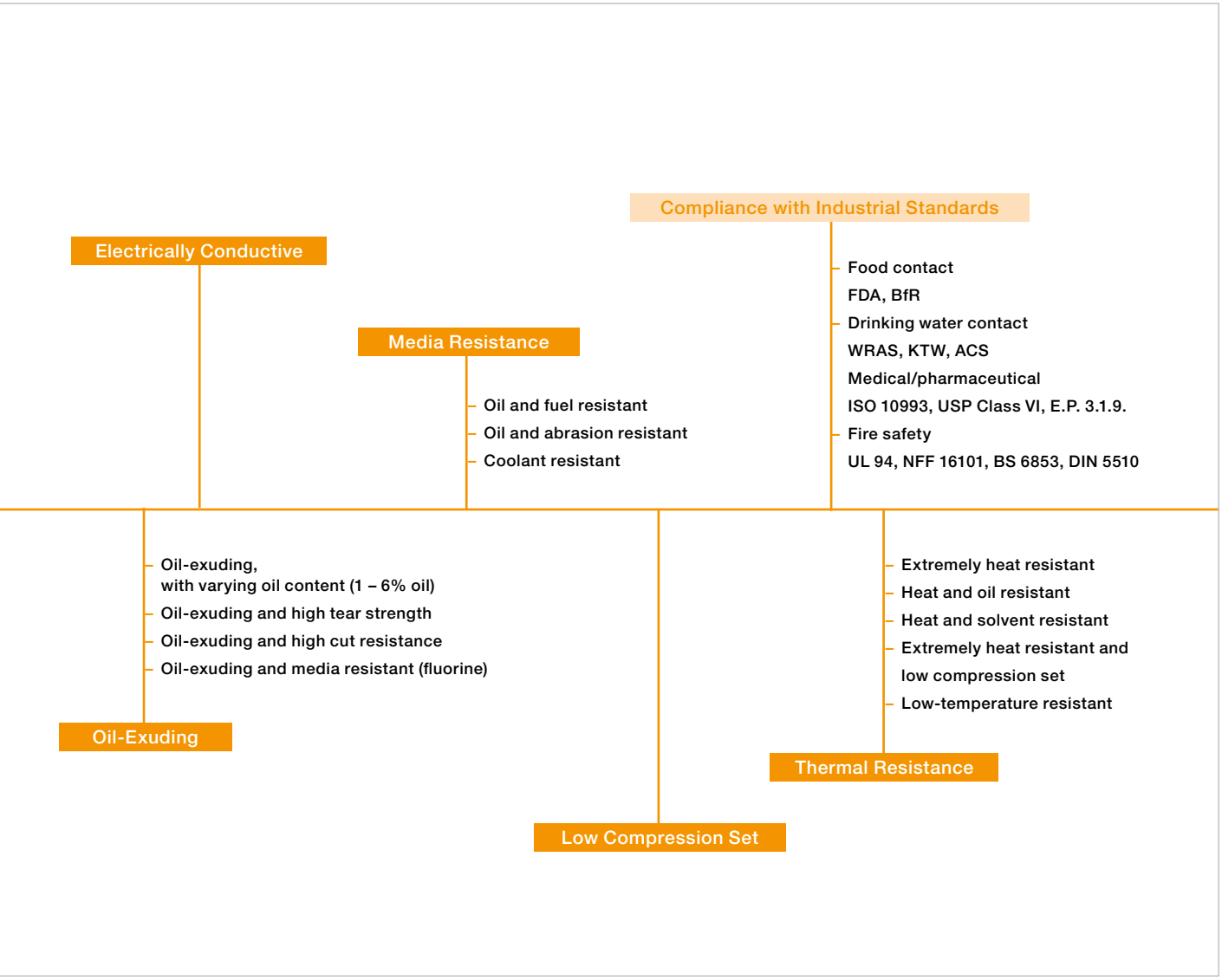


SECTION 4:
MATERIAL PREPARATION

Contents

Temperature, viscosity, additives and what to consider in advance

4.1
STORAGE OF SOLID SILICONE RUBBER

Properly stored, ELASTOSIL® solid silicone rubber has a shelf life of up to 12 months depending on the grade. Products which have been stored longer may also still be usable. For quality assurance reasons, however, you should check that the rubber still has the properties required for the intended use.

Storage-Induced Increase in Mooney Viscosity

Long-term storage of silicone rubber may cause a rise of its Mooney viscosity. This is due to polymer/filler orientation that causes stronger mutual interaction. However, this phenomenon is reversible, and the rubber can be processed in the normal way within the given storage period. The viscosity is reduced when additives are blended in on a roll mill or when the rubber is extruded or compression molded. Rubber which has been stored too long can usually be made suitable for processing by replasticating it on a roll mill. If this doesn't work, a mastication aid may be used in addition.

General Information on Storing ELASTOSIL® Solid Silicone Rubber

- Store in closed containers in cool rooms at 0 – 30 °C
- Do not expose to direct sunlight
- Keep separate from organic rubber and crosslinker chemicals

Caution:

- If stored above 30 °C, platinum-catalyzed grades and compounds containing Crosslinker E are particularly susceptible to scorching
- Contact with organic rubber may inhibit the curing system and also cause discoloration

4.2
STORAGE OF LIQUID SILICONE RUBBER

If kept in closed containers at 0 to 30 °C, ELASTOSIL® liquid silicone rubber has a shelf life of up to 12 months from the delivery date depending on the grade. Even if the product is stored for longer than the recommended time, you can usually still use it. For quality assurance reasons, however, please check that the rubber still has the properties required for the intended use.

Viscosity Increase

As with solid silicone rubber, the viscosity of liquid silicone rubber may increase during storage.
This is due to a particular polymer/filler orientation that can be reversed at any time. Despite its higher viscosity, the rubber can be processed in the normal way within the given storage period. When the rubber is injected into the injection molding machine, the screw generally causes its viscosity to decrease, enabling the rubber to flow better and fill the mold.

General Information on Storing ELASTOSIL® Liquid Silicone Rubber

- Store in closed containers in cool rooms at 0 – 30 °C
- Higher average temperatures may shorten the shelf life
- Do not expose to direct sunlight
- When opening the container, make sure that no dirt falls onto the surface of the rubber

Safety information:
Please consult our safety data sheets if you require additional safety information.

4.3 COMPOUNDING

ELASTOSIL® solid silicone rubber is characterized by its ease of processing. Most applications involve the use of additives. Typically, the compounding components are blended in the following order: rubber, stabilizers, colorant, crosslinker. In the case of non-ready-to-process solid silicone rubber grades, crosslinker and any other necessary additives, stabilizers or pigment pastes are blended in on the roll mill. At WACKER, compounds which do not contain additives have the affix oH or S (standard). We offer many solid silicone rubber grades in a ready-to-process form (having the affix mH) or as a customized, ready-to-use SILMIX® grade.

Recommendations*

- The roll mills should be temperature-controlled (water cooling)
- Friction should be about 1:1.2. If your roll mills have rough surfaces, soft formulations may stick to them
- The roll nip should be always adjusted in such a way to allow the formation of a sufficient rubber bead (= mixing zone) in the nip
- First feed the harder grade onto the roll mill, then the softer one, and homogenize them thoroughly
- Homogenize the silicone rubber for 2 to 10 minutes before incorporating paste additive
- To speed up and optimize homogenization, make frequent incisions at the edges of the sheet, or roll it up into “dollies” and fold it back into the center of the nip

* All recommendations are intended only as a suggestions and not as instructions for any particular application. It is essential that you check for yourself in how far these recommendations are suitable for your application, your compound and your machine.

4.3 COMPOUNDING STABILIZERS AND ADDITIVES

For particularly demanding applications, special properties of solid silicone rubber can be further enhanced by the addition of stabilizers and other additives.

Improving Hot-Air Resistance

Parts exposed to extremely high temperatures, such as turbocharger hoses, need to be heat-stabilized. Special oxides of transition metals (e.g. iron) and special carbon blacks are particularly suitable for this purpose. WACKER supplies hot-air stabilizers ELASTOSIL® AUX H0-H6 in the form of pastes that are readily incorporated via the roll mills. The correct choice of stabilizer depends on the crosslinker, color and operating temperature. Please note that crosslinker ELASTOSIL® AUX E is incompatible with stabilizer ELASTOSIL® AUX H3. All other heat stabilizer grades can be used without restriction. Crosslinkers ELASTOSIL® AUX C1 and ELASTOSIL® AUX C6 can be used safely with all stabilizers. Although stabilizer ELASTOSIL® AUX H0 is milky white, it causes a slight brown discoloration of the cured rubber product under the influence of thermal aging. It should therefore be preferably used for colored compounds. The tables show our recommendations for choosing a suitable heat stabilizer.

Reversion Stabilizers

Stabilizer ELASTOSIL® AUX R is used as an anti-reversion agent (reversion = breakdown of the network). It also prevents a blooming effect on the surface of non-post-cured rubber products by binding by-products of crosslinker ELASTOSIL® AUX E (2.4–dichlorobenzoyl peroxide). Stabilizer ELASTOSIL® AUX R simultaneously improves the rubber's oil resistance. We recommend adding 0.8 – 1% paste via the roll mill.

Recommendations for the right choice of heat stabilizer are depicted in the following table

ELASTOSIL® AUX stabilizer	Recommended maximum service temperature	
	Peroxide curing rubber	Addition curing rubber
H0	225 °C	225 °C
H1	250 °C	225 °C
H2	250 °C	250 °C
H3	275 °C	275 °C
H4	275 °C	225 °C
H6	300 °C	225 °C
H6 F	300 °C	225 °C

The hot –air resistance of ELASTOSIL® LR grades can be improved by adding ELASTOSIL® COLOR PASTES FL

ELASTOSIL® COLOR PASTE FL	Recommended maximum service temperature
IVORY RAL 1014	225 °C
RED RAL 3013	225 °C
BLACK RAL 9005	250 °C

4.3 COMPOUNDING STABILIZERS AND ADDITIVES

Improving Flame Resistance

If the flame resistance has to be improved, we recommend adding 2.2% ELASTOSIL® AUX Batch SB 2.

Using a Mold-Release Aid

In the production of press-vulcanized rubber parts, the metal molds are often treated with external release agents, e.g. with ELASTOSIL® AUX Mold Release Agent 32. The internal mold release agent ELASTOSIL® AUX Mold Release Agent A can serve as a feasible alternative. The paste is incorporated into the rubber in a concentration between 0.3 and 1.0%. However, consider the following: ELASTOSIL® AUX Mold Release Agent A slightly impairs the rubber's compression set. We therefore strongly advise you to conduct thorough tests before using it!

Adding Fillers on Roll Mills

Never add quartz powder on an open roll mill because of the silicosis risk. It is better to use products already containing quartz powder, such as ELASTOSIL® R 701 or R 780/80 from WACKER. Small amounts of amorphous fillers, such as diatomaceous earth or pyrogenic silica, can be added on a roll mills fitted with a good ventilation hood.

Fillers and Additives

Additive group	Additive
Stabilizer R	ELASTOSIL® AUX Stabilizer R
Heat stabilizers	ELASTOSIL® AUX Stabilizer H0
	ELASTOSIL® AUX Stabilizer H1
	ELASTOSIL® AUX Stabilizer H2
	ELASTOSIL® AUX Stabilizer H3
	ELASTOSIL® AUX Stabilizer H4
	ELASTOSIL® AUX Stabilizer H6
	ELASTOSIL® AUX Stabilizer H6 F
Mastication aids	ELASTOSIL® AUX Mastication Aid 4
Mold release agents	ELASTOSIL® AUX Mold Release Agent 32
	ELASTOSIL® AUX Mold Release Agent A
Flame resistance	ELASTOSIL® AUX Batch SB 2
Foam batches	

You Don't Do your Own Compounding?

WACKER supplies almost 1.000 different ready-to-use rubber grades. We also supply additional, customized grades whenever required.
Just ask us about our SILMIX® system!

Description/effect	%	Comments	BfR*	FDA**
Improves oil resistance and reversion stability	0.8 – 1	Lowers reversion tendency (thermal network breakdown) Binds by-products of crosslinker E, thus preventing surface blooming Easy to add on the roll mill		
Milky white	0.5 – 2	May cause slight brown discoloration of the cured rubber		
Reddish brown	3		●	●
Beige	2			
Jet black	1.5	Incompatible with ELASTOSIL® AUX Crosslinker E	●	●
Reddish brown	3		●	●
Beige	3			
Beige	3			●
Enhances ease of adding and soft-rolling properties on the roll mill, and stabilizes the viscosity	1 – 3		●	●
Improves mold-release properties; a detergent which is sprayed onto the mold			●	●
Improves mold-release properties; paste for adding to the solid rubber	0.3 – 1	Has a negative effect in the compression set test and should only be used after thorough testing	●	●
Improves flame resistance	2.2			
		Upon request		

* BfR XV, Part A, "Silicones", 182. Communication BGBl. 32, 211 (1989).
** FDA Chapter 21 CFR § 177.2600 Rubber Articles Intended for Repeated Use.

4.3 COMPOUNDING COLORS

WACKER is a “one-stop supplier”. We can supply you with suitable pigment pastes for both solid silicone rubber grades (ELASTOSIL® PT pigment pastes) and liquid silicone rubber grades (ELASTOSIL® FL pigment pastes). To ensure optimal processing, the viscosity of these pastes is adjusted to match that of our silicone rubber grades.

Choosing your Color

Choose the color you would like from our range of standard and special colors (see table on page 35). As our pigment additives can be mixed together in any ratio, almost any desired color can be obtained. Our technical support specialists will gladly assist you in mixing a specific color in their lab.

For special regulatory requirements we offer a broad range of FDA- and BfR-compliant pigments. We will gladly advise you on existing dosage limits prescribed by these standards. Please also contact us if you require pigments compliant with USP Class VI und ISO 10993.

Adjusting Colors with PT Pastes on the Roll Mill

We recommend adding the PT pigment pastes together with the crosslinker because a homogeneously colored material will then indicate uniform crosslinker distribution.

Processing Tip

We recommend to homogenize PT color pastes on the mill and FL color pastes through stirring before use. In general, PT color pastes are dosed with 1%, FL pastes with 2%. Please note the specific exceptions like e.g. for color paste 9005.

Looking for a Special Color?

Should you require a particular color not included in our standard pigment paste range, we will formulate a customized paste on request. Just contact us!

The conformity values quoted in the table alongside are not guaranteed because the relevant regulations can change. Please consult our Technical Service for the latest data.

[1] The RAL values in the table are only a guide.
[2] BfR and FDA compliance necessitates adhering to existing dosage limits. We will be glad to assist you.
[3] Not suitable for use with crosslinker E.
[4] For questions regarding the biocompatibility of our PT pigment pastes, please contact our technical service department.
[5] Please consider the defined time-temperature use conditions (B-H) acc. to table 2 under 21 CFR §176.170.
[6] Please consider the defined time-temperature use conditions (C-H) acc. to table 2 under 21 CFR §176.170.

ELASTOSIL® PT Color Pastes

Color name	Similar to RAL[1]	BfR[2]	FDA[2]	Color
Standard colors				
Yellow	RAL 1016[5]	●	●	
Reddish-brown	RAL 3013	●	●	
Blue	RAL 5022	●	●	
White	RAL 9010	●	●	
Black standard		●		
Other colors				
Yellow	RAL 1021[5]	●	●	
Yellow	RAL 1026 F[6]	●	●	
Yellow	RAL 1033[5]	●	●	
Orange	RAL 2004	●		
Orange	RAL 2004 F[5]	●	●	
Red	RAL 3000			
Reddish-violet	RAL 4002	●	●	
Ultramarine blue	RAL 5002	●	●	
Dark blue	RAL 5010	●	●	
Light blue	RAL 5015	●		
Helio green	RAL 6004	●	●	
Green	RAL 6017	●	●	
Gray	RAL 7040	●	●	
Pale brown	RAL 8003	●		
Dark brown	RAL 8015	●		
Deep black	RAL 9005[3]	●	●	
Black	RAL 9017	●	●	

ELASTOSIL® FL Color Pastes

Color name	Similar to RAL[1]	BfR[2]	FDA[2]	USP Class VI / ISO 10933[4]	Color
Standard colors					
Yellow	RAL 1016[5]	●	●	●	
Iron oxide red	RAL 3013	●	●		
Blue	RAL 5022	●	●	●	
White	RAL 9010	●	●	●	
Deep black	RAL 9011	●	●	●	
Other colors					
Ivory	RAL 1014		●		
Yellow	RAL 1006	●	●		
Yellow	RAL 1021[5]	●	●		
Yellow	RAL 1026	●			
Yellow	RAL 1026 F[6]	●	●	●	
Yellow	RAL 1033[5]	●	●		
Reddish-brown	RAL 2001	●	●		
Orange	RAL 2004	●			
Orange	RAL 2004 F[5]	●	●	●	
Dark red	RAL 3000				
Red	RAL 3020[5]	●	●		
Reddish-violet	RAL 4002	●	●	●	
Ultramarine blue	RAL 5002	●	●		
Dark blue	RAL 5010	●	●	●	
Light blue	RAL 5015 F	●	●		
Helio green	RAL 6004	●	●	●	
Green	RAL 6010	●	●	●	
Gray	RAL 7000	●			
Deep black	RAL 9005[3]	●			
Black	RAL 9005 F[3]	●	●		

Our ELASTOSIL® AUX PT bzw. FL show a a minimum temperature resistence of 42d/175°C or 21d/200°C or a UV-resistance of 21d (exposure in UV weathering chamber). For higher requirements please contact our technical service.

4.3
COMPOUNDING
PEROXIDE CURING

WACKER offers three different peroxide crosslinkers for peroxide curing.

For Pressureless Vulcanization: ELASTOSIL® AUX Crosslinker E

We recommend ELASTOSIL® AUX Crosslinker E for pressureless vulcanization, e.g. for the extrusion of hoses, profiles and the like.

Processing tips:
It is important to remember that ELASTOSIL® AUX Crosslinker E begins to react at approx. 100 °C:

- Always cool the rolls (< 60 °C)
- Never roll up the rubber sheet into thick “dollies”. Lay it out to cool for approx. 30 minutes in strips not thicker than 15 mm, either open to the air or covered loosely with a PE film
- Store catalyzed rubber compounds at a temperature below 30 °C to prevent premature curing

For Vulcanization under Pressure or in Steam: ELASTOSIL® AUX Crosslinker C1

ELASTOSIL® AUX Crosslinker C1 is used for producing compression molded articles. ELASTOSIL® AUX Crosslinker C1 is hardly affected by temperature and can be handled safely under typical processing conditions. It decomposes at 155 °C.

Processing tips:

- Add the crystalline crosslinker at about 45 °C. At this temperature, the crystals melt and the liquified crosslinker is distributed homogeneously
- Intensive cooling of the roll mill is unnecessary
- The sheeted out rubber may be thicker than 15 mm in this case, and it can be folded into a zig-zag when laid out
- Avoid contact with atmospheric oxygen: all surfaces that come into contact with oxygen during crosslinking remain sticky

For Vulcanization under Pressure or in Steam: ELASTOSIL® AUX Crosslinker C6

ELASTOSIL® AUX Crosslinker C6 is only used for processing rubber in compression molds and is easily incorporated on the roll mill. Like ELASTOSIL® AUX Crosslinker C1, Crosslinker C6 is largely unaffected by temperature. It is stable up to 160 °C, making processing particularly unproblematic.

Processing tips:
Avoid contact with atmospheric oxygen: all surfaces that come into contact with oxygen during crosslinking remain sticky.

Peroxide Crosslinkers

Name/grade	Peroxide	%	Vulcanization [°C]	Processing
ELASTOSIL® AUX Crosslinker E	(50% paste in silicone fluid) bis-(2.4-dichlorobenzoyl-)peroxide	1.5 – 1.8	> 100	Especially suitable for rubber that is vulcanized under low-pressure conditions, especially for the extrusion of hoses and profiles
ELASTOSIL® AUX Crosslinker C1	Dicumyl peroxide (98%), crystalline powder	0.6 – 0.9	165 – 190	For manufacturing molded parts
ELASTOSIL® AUX Crosslinker C6	(45% paste in silicone rubber) 2,5-bis-(tert.-butylperoxo)-2,5 dimethylhexane	0.6 – 1.5	170 – 190	For manufacturing compression molded parts, easy to add on the roll mill

4.3 COMPOUNDING PLATINUM-CATALYZED CURING

We recommend platinum-catalyzed addition curing for all applications in which it is important that:

- No odor or flavor is produced (e.g. for food-contact applications)
- No volatile peroxide by-products are released
- Transparent articles do not discolor during post-curing
- Curing is fast and cycle times therefore short
- The cured product is readily demoldable and has a dry surface

WACKER Offers Two Types of Solid Silicone Rubber for these Applications:

- Ready-to-process compound: The platinum-catalyst is already contained in the rubber formulation (1-part compound), as typified by the grade ELASTOSIL® R *plus* 4001.
- 2-part system: The catalyst is added later. WACKER offers the catalysts ELASTOSIL® AUX Batch PT1 (for extrusion) and PT 2 (for molded articles). For example, the catalyst PT 1 is used with the grade ELASTOSIL® R *plus* 4305.

Processing tips:
Platinum-catalyzed grades may start crosslinking even at room temperature; therefore it is important to avoid exceeding the shelf life. We recommend carrying out preliminary tests to ensure that the rubber still has the required processing properties. It is important that all batches are stored for the same length of time between compounding and processing. Catalyst poisons in the ambient air inhibit curing. This is particularly true of amines and sulfur containing compounds, which are common components of organic rubber systems.

So always keep platinum-catalyzed silicone rubber well separated from organic rubber during storage and processing, and always clean roll mills and processing machinery meticulously to avoid cross-contamination.

Storing and Adding Crosslinker

- Always store peroxides in cool rooms
- Shelf life approx.12 months
- To ensure homogeneous distribution, spread pasty crosslinkers onto the sheeted-out rubber during roll milling
- Add powdered crosslinkers portion-wise, and avoid inhaling any dust

Tip

Any special requests?
Further crosslinkers are available for special requirements

Platinum Catalysts

Crosslinkers		%	Vulcanization [°C]	Recommended for rubber grades	Recommended for processing
ELASTOSIL® AUX Batch PT 1	Catalyst paste	1.5 – 2	165	ELASTOSIL® R *plus*	Extrusion
ELASTOSIL® AUX Batch PT 2	Catalyst paste	1.5 – 2	165	ELASTOSIL® R *plus*	Molded articles
SILPURAN® Curing Agent X	Catalyst paste	1.5 – 2	165 – 180	SILPURAN®	Extrusion of medical articles
SILPURAN® Curing Agent M	Catalyst paste	1.5 – 2	165 – 180	SILPURAN®	Molded medical articles

We offer additional catalysts for textile coating formulations and will gladly advise you on your specific application.

SECTION 5:
PROCESSING THE MATERIAL

Contents

Everything you need to know about processing ELASTOSIL® silicone rubber

5.1 INTRODUCTION

ELASTOSIL® silicone rubber can be processed in a variety of ways. The main processes include extrusion, coextrusion, compression molding, transfer molding, injection molding and knife coating (on textiles). Calendering and low-pressure filling are also possible.

Selecting the Best Process

Since the choice of process always depends on a number of factors, the following questions should be clarified:

- How are the properties specified for the application?
- Which chemical and physical properties is the vulcanized rubber required to have?
- How large is the required production series?
- Is liquid or solid silicone rubber the right choice?
- Which sort of geometry does the part have? Complex or simple?
- Which equipment is available and how much investment is required, if any?
- What experience/expertise is available for the particular processes?

A rapid decision can then be made about which processing technique to choose. For complex part geometries in large quantities, for example, injection molding is recommended, while extrusion is to be preferred for producing continuous articles.

Extrusion of ELASTOSIL® solid silicone rubber into tubing

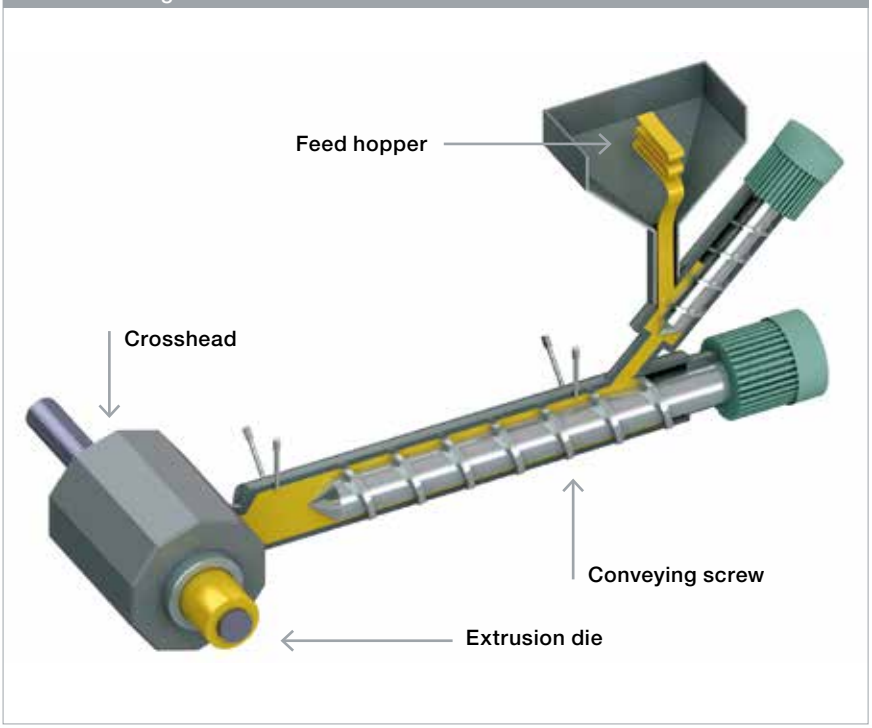
Selection of the Rubber Grade by Process

Processing	Solid silicone rubber	Liquid silicone rubber
Extrusion	•	
Coextrusion	•	
Compression molding	•	
Transfer molding	•	
Injection molding	•	•
Doctor blade	•	•
Calendering	•	
Low-pressure filling		• (low-viscosity grades)

5.2 EXTRUSION

Extrusion is a continuous manufacturing process in which silicone rubber is squeezed through a die and then vulcanized. The die gives the extrudate its shape. The required pressure is produced via a conveying screw, in which the material is homogenized, compressed and deventilated.

Schematic Diagram of an Extruder with Crosshead Die



Typical Application

Extrusion is mainly used for the following products:

- Tubing
- Profiles
- Cables
- Flat tape
- Round cord

Selection and Preparation of the Material

Peroxide and addition-curing ELASTOSIL® solid silicone rubber grades are suitable for extrusion. The materials are either available as ready-to-process compounds or have to be compounded in advance.

For this purpose, the rubber is compounded with the required additives and crosslinkers on the roll mill. To eliminate contaminants from the rubber compound, it should be subsequently passed through a strainer.

Screens of approx. 100 µm mesh remove foreign particles, homogenize the material, and eliminate any trapped air.

5.2 EXTRUSION METERING

RotoFeeder® as metering unit for extrusion and injection molding

Interior of the RotoFeeder®: Feed hopper with conveying screw

CTM® from Colmec

The extruder should be fed as uniformly as possible. This can be done manually, semi-automatically or automatically.

Manual Feeding

For manual feeding, a sheet is produced on the roll mill, cut into strips and fed into the feed hopper manually.

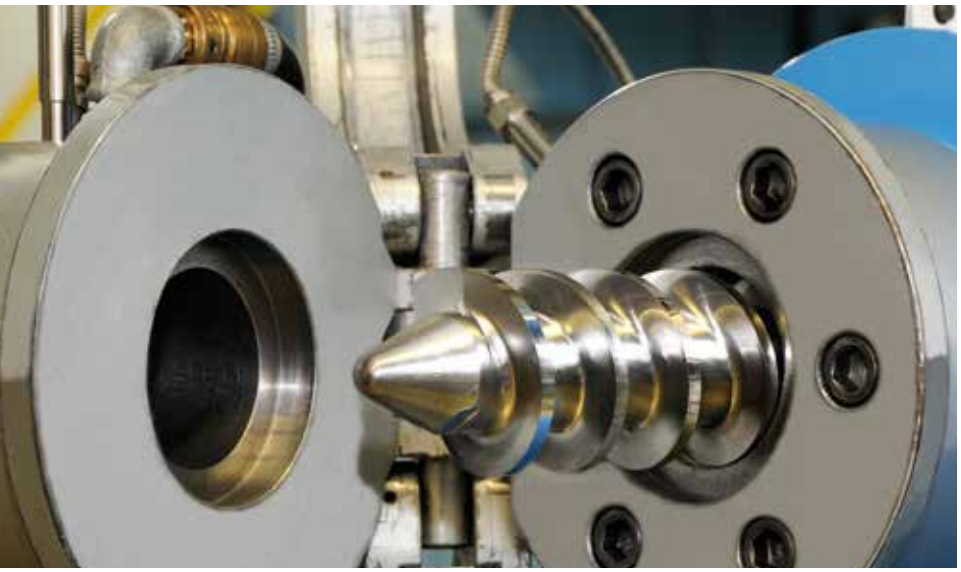
Semi-Automatic Feeding

We offer special delivery forms for semi-automatic feeding. The rubber strips have already been wound into coils in the plant. They can be placed on a rotating disk coiler. Operation can be integrated directly into the extruder's machine control. Alternatively, the coil strips can be introduced directly from the cardboard box via a take-off unit.

Automatic Feeding

Feeding and metering can be performed automatically using appropriate auxiliary equipment (e. g. PolyLoad® from Krauss Maffei, RotoFeeder® from Engel or CTM®-System from Colmec). The material is transferred to a reserve container containing one or more screws. The screw feeds the extruder continuously via the outlet opening. For this purpose, ELASTOSIL®/SILPURAN®/SILMIX® solid silicone rubber can be used in all delivery forms.

5.2
EXTRUSION
CONVEYING IN THE SCREW



Open extruder with conveying screw

The screw performs several functions during the process, it conveys and compresses the rubber while at the same time building up the pressure for deaeration of the material. Homogenization, back venting and output rate can be controlled by varying the screw geometry and machine parameters.

Screw Design

- Feeding is facilitated by maximum flight clearance in the screw feed zone. Slots in the flights have also proved successful
- One or two-flight screws with compression ratios from 1 : 1.5 to 1 : 2 can be used. Twin-flight screws increase output
- A progressive core or flight pitch is an advantage. With progressive cores, the core diameter increases gradually from the feed zone towards the screw tip. With a progressive pitch, the flight pitches decrease towards the screw tip
- Typical screw dimensions are length : diameter = 10 : 1 to 12 : 1
- The screw and cylinder jacket must be cooled to prevent scorching of the material

5.2
EXTRUSION
EXTRUSION DIE

The extrusion die determines the profile of the cured rubber. Die design does not require any specific measures for silicone rubber; the customary guidelines apply.

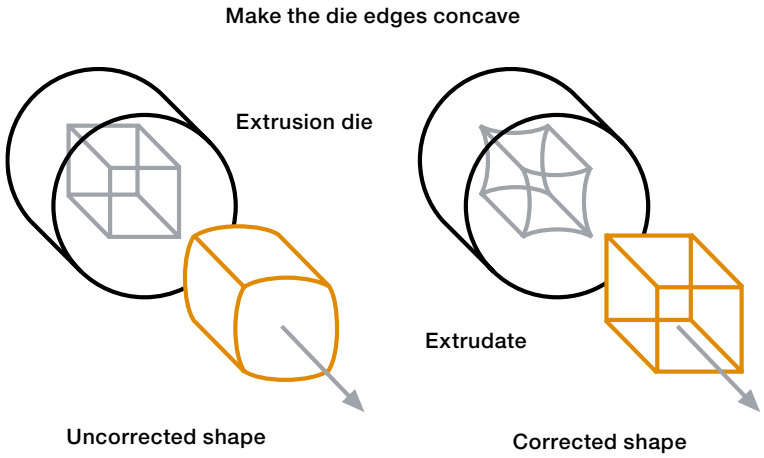
- The wall should have the same thickness in all areas of the die
- Avoid sharp edges or corners: they can cause rough surfaces on the extrudate
- Avoid dead corners and sudden changes in direction of flow: material can accumulate in the dead corners and vulcanize
- It is important to have a uniform flow rate across the cross section. Material more distant from the die center has a slower flow rate. For the production of straight edges a concave design of the die edges is required

Compensating the Die Swell

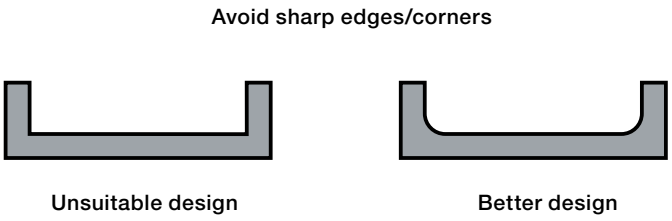
The extrudate swells as it leaves the die. This phenomenon is affected by:

- Viscosity: the lower the viscosity, the greater the die swell
- The material temperature: the higher the temperature, the greater the die swell
- The extrusion velocity: the faster the extrusion, the greater the die swell
- The die diameter: the smaller the die, the greater the die swell

Projection of the Die Geometry



Design of the Edges of a Die for an Open Profile



If the take-off belt of the heating tunnel runs faster than the extrudate leaves the die, stretching occurs. This can be used to adjust the desired diameter of the extrudate. As a result, die swell can be compensated and cured products manufactured with diameters smaller than the die orifice.

5.2 EXTRUSION CURING

Cable production: extrusion with subsequent vulcanization in the infrared tunnel

Extrudates are usually vulcanized via vertical or horizontal heating zones, with or without pressure. Silicone rubber is usually not vulcanized in a salt bath, though this option is possible in principle for peroxide-curing compounds.

Vulcanization in Heating Zones without Pressure

Tubing and profiles are usually vulcanized in a heating zone (at 200 – 500 °C) without the application of external pressure. Horizontal or vertical heating tunnels are heated by means of resistance heaters, infrared heating bars with reflectors, hot-air systems or ceramic dark radiators. The extrudates are conveyed on sheet-steel or mesh conveyor belts. The conveyor belts run on movable deflector rolls to compensate for the thermal expansion of the belt. Their velocity can be regulated. The conveyor belt return should be located in the heating tunnel to prevent excessive cooling. If this is not possible, use covers to prevent rapid heat loss.

To avoid pressure marks resulting from the conveyor belt, a shock tunnel can be fitted upstream in horizontal heating zones to prevulcanize the parts at about 600 °C.
In many instances, it is preferable to extrude vertically using an extruder head deflected through 90 °. This prevents belt pressure marks, so that even very soft materials can be easily processed.

Hose vulcanization in a horizontal hot-air tunnel

Vulcanization in Heating Zones with Pressure

Continuous vulcanization (CV) lines are primarily used to manufacture cables. Heating is usually by means of pressurized steam.
The line is usually fed with steam at a pressure of 4 to 20 bar. At least 6 bar is necessary to achieve the required vulcanization temperature. Different steam temperatures are reached, depending on the supply pressure. With this process, the extruder head is continually supplied with saturated steam. To prevent scorching, the extruder head must be intensively cooled. The vulcanization time depends on the length of the zone, the temperature, and the wall thickness of the insulation. It is usually between 30 seconds and 2 minutes.

General Information on Extrusion

Cooling:

During extrusion, high shearing rates occur, which generate heat.

- To avoid scorching, the extruder, screw and extruder head should be cooled to ensure that the rubber temperature lies safely below the decomposition temperature of the peroxide
- In addition, the highest output rates are obtained when the cylinder is cooled

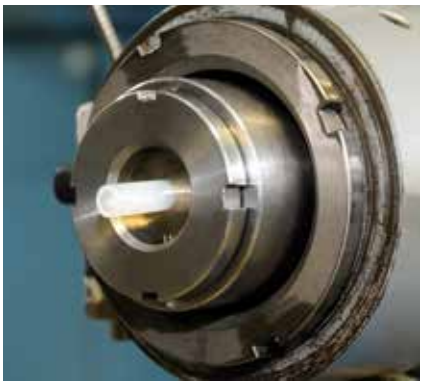
Extruder Size:

- Extruders with 45 to 90 mm screw diameter and an L/D ratio of 10 : 1 to 16 : 1 (typically 10 : 1 to 12 : 1) are most commonly used
- The bigger the extruder, and therefore the screw, the lower is the speed, and therefore the heat of friction for the same output

Coextrusion

Coextrusion allows extrudates to be produced from different materials. For example, it allows the manufacture of striped tubes, pigmented extrudates, or sheets with an extruded-on profile. WACKER offers self-adhesive ELASTOSIL® R *plus* grades for this purpose.

5.2
EXTRUSION
TROUBLESHOOTING



Fluctuations in the extrudate geometry

The following table shows the most common faults and possible causes. If you still have any questions, please ask your WACKER contact or call the WACKER info line.

In General, to Avoid Problems:

- The material has to be mixed homogeneously and has to be free of impurities
- The extruder should be thoroughly cleaned between two production runs
- Fluctuations in the material temperature and pressure should be avoided
- Material feed into the extruder should be uniform
- Strainer screens should be used (for ventilation of the material and to avoid pressure fluctuations)
- All machines should be regularly maintained

Overview

Fault	Possible cause
Bubbles	Atmospheric moisture on machines, air inclusions
Fisheyes	No strainer sieve, scorching of particles due to excessive material temperature, inhomogeneous mixing
Brittle extrudate/white stripes when the extrudate is stretched	Material damage due to high curing temperature
Round, soft region in the center of the extrudate	Insufficient curing, line speed too high or temperature too low
Sharp edges on the extrudate have a sawtooth structure	Poor die design
Fluctuation in the extrudate geometry	Fluctuations in the material pressure or temperature
Rough surface	Scratched/damaged die surface, material temperature too high

5.3
PRESS MOLDING PROCESSES
COMPRESSION AND TRANSFER MOLDING

Press molding processes are used for a wide range of applications. ELASTOSIL® solid silicone rubber is vulcanized in molds by heat and pressure. Compression and transfer molding are the preferred methods for solid silicone rubber.

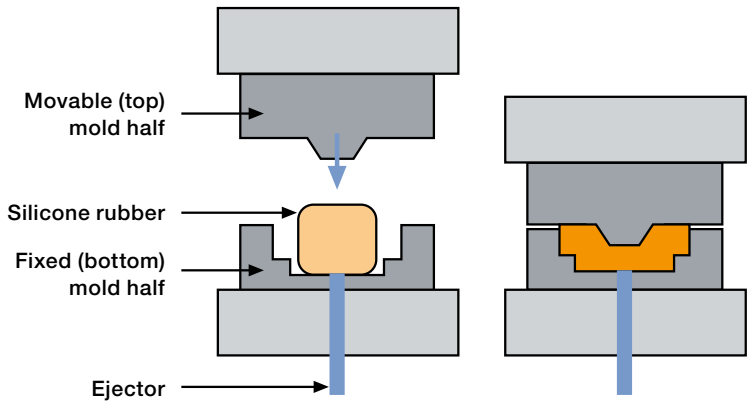
Material Selection/Mold Filling

For compression molding, peroxide-curing and platinum-catalyzed ELASTOSIL® solid silicone rubber grades are preferred. Each cavity is individually filled with a precisely weighed amount of rubber.

Pressing/Vulcanization

The platen presses are usually hydraulically operated, they are heated, e.g. electrically or with steam. For vulcanization of peroxide mixtures with ELASTOSIL® AUX Cross-linker C1 or C6, and for platinum-catalyzed solid silicone rubber, a mold temperature of about 150 to 200 °C is usually chosen. The temperature plays an important role: it is required to be as high as possible to shorten the vulcanizing time, and therefore the cycle times. However it must not be too high, since scorching may otherwise occur. The vulcanizing time is determined by the temperature of the material, the mold temperature and the thickness of the part.

Compression Molding

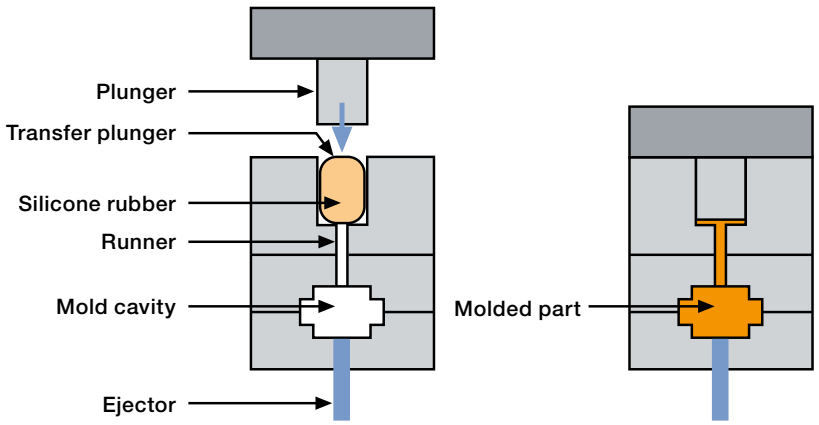


Demolding

External and internal mold-release agents can be used to assist demolding.

- External release agents :
  In this case, a 1 – 3% aqueous solution of the mold release agent ELASTOSIL® AUX Mold Release Agent 32 is sprayed into the hot mold. The process is repeated as required.
- Internal mold-release agents: Alternatively, ELASTOSIL® AUX Mold Release Agent A can be added to the silicone rubber. However, it should be correctly metered. Too much release agent can lead to mold contamination by forming deposits on the hot mold wall. It can also cause inhomogeneities in the end product. If the mold release agent is pushed forward by the flow front during mold filling, it can lead to (undesirable) weld lines as a result of incomplete welding of the merging flow fronts. In both cases, the end product is no longer usable.

Transfer Molding



Transfer molding is a development of compression molding. It is more economic for small-volume parts with complex geometries, which are produced in large quantities and with less manual work (no secondary finishing). It differs from compression molding in that the mold is charged via a chamber (the “pot”) with runner. Transfer molding is particularly suitable for producing moldings in which high dimensional accuracy is required (precision parts).

Material Selection/Mold Filling

The pot is charged with a defined amount of silicone rubber. A plunger then forces the rubber through a runner into the mold. For greater economy, several molds can be filled by using a sliding table unit or runner manifold.

Die Cutting/Slitting

Die cutting offers an economic alternative for very small quantities. In this process, parts such as O-rings are die cut from extruded, calendered or pressed sheet.
Note that silicone rubber grades with high notch resistance are not easy to die cut. It is better to use blends of elastic grades and standard extrusion grades. Always carry out tests in advance.

For Safety's Sake

- Please follow the instructions in our material safety data sheets
- We recommend using an extractor to purify the room air

5.4
INJECTION MOLDING

Injection molding is currently the most popular and efficient method of processing large quantities of silicones where there are strict demands for consistently high product quality.

Advantages of Injection Molding

Injection molding is characterized by high dimensional accuracy. It produces high quality parts without secondary finishing, and allows much shorter production cycles than other processes. The disadvantages are higher mold and machine costs, though these can be offset by the high productivity.

Typical Applications

Injection molding is particularly suitable for the production of large numbers of small to medium-sized parts, such as:

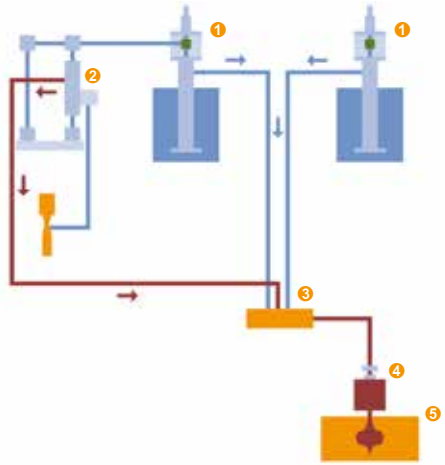
- Nipples for baby bottles
- Gasket rings

Material Selection

ELASTOSIL® solid silicone rubber and ELASTOSIL® liquid silicone rubber are both suitable for injection molding.

5.4
INJECTION MOLDING
METERING AND MIXING

Mixing and Metering Equipment for Liquid Silicone Rubber



❶ Metering unit for the A and B components of the liquid silicone rubber

❷ Metering unit for pigment/ additives

❸ Mixing station

❹ Metering cylinder

❺ Heated injection mold with injection-molded part

Due to their widely differing viscosities, liquid and solid silicone rubbers are metered and mixed differently.

ELASTOSIL® Liquid Silicone Rubber

Liquid silicone rubber grades require special metering and mixing systems.

Metering

The metering units pump the A and B components of liquid silicone rubber directly from the pails or drums in a ratio of 1 : 1 and feed it to a mixer, and then to the feed dosing cylinder of the injection-molding machine. If required, ELASTOSIL® Pigment Paste FL can be fed to the mixer via an additional pigment line.

Mixing

A static or dynamic mixer can be used. Static mixers do not have moving parts; the material is homogenized via fixed mixing elements in the interior. Dynamic mixers have moving parts supporting the homogenization. Static mixers are typically used for liquid silicone rubbers. After the two components A and B have been mixed, the material can be injected into the mold.

Injection

The mixed material is metered and injected into the mold with a screw in the injection cylinder. Modern injection molding machines offer precise control of the injection process.

Pot Life

At room temperature (about 20 °C), the A/B mixture has a pot life of at least three days. If the temperature is higher, the pot life may decrease correspondingly. To prevent premature vulcanization, it is advisable to thermostat the metering cylinder and mixer.
The injection unit should be flushed with one of the components before relatively long production breaks of more than three days.

ELASTOSIL® Solid Silicone Rubber

ELASTOSIL® solid silicone rubber for injection molding is available in two supply forms:

- As ready-to-process material in different delivery forms. Preferably as bars, but also as strips or round cord, etc.
- As a silicone rubber base compound, to which the crosslinker and possibly other additives are added. This is usually performed via roll mills (see section 4, page 30)

Metering

Solid silicone rubber is generally metered to the injection molding machine via a stuffing box. It is generally performed either semi- or fully automatically in the case of profile strips. As an alternative to the stuffing box, RotoFeeder® (Engel) or PolyLoad® (KraussMaffei) systems can be used.

The cylinder and discharge from the stuffing box are usually maintained at 40 – 50 °C to facilitate material feed.

Please Note

- The A and B components of liquid silicone rubber should have the same batch number, since the curing systems are matched to one another within a batch
- If the silicone rubber contains abrasive fillers, the cylinder, screw, non-return valve, needle valve, sprue and runners must be hard-faced

RotoFeeder® is a registered trademark of Engel.
PolyLoad® is a registered trademark of Krauss Maffei.

5.4
INJECTION MOLDING
INJECTION AND VULCANIZATION

ELASTOSIL® Liquid Silicone Rubber

There are two types of sprue system: indirect gating via a cold runner and hot sub-runner, or direct gating. The cold runner may have a hydraulic needle valve. Each gating method has its pros and cons.

Indirect Gating

The material is injected into the cavities through a cold runner, via a manifold. The vulcanized sprue waste must be removed from the mold together with the molding, and discarded after separation from the molded part.

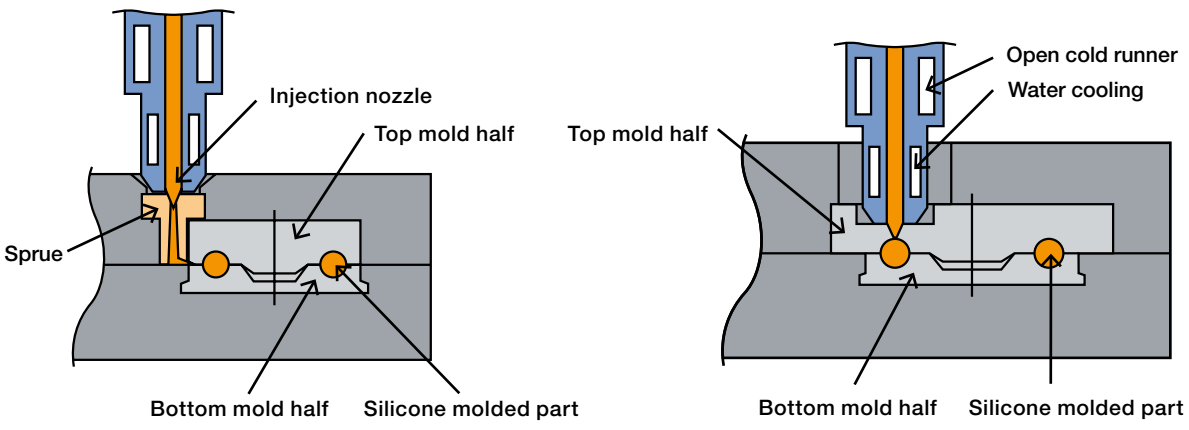
- Advantages:
  - Less expensive mold making
  - Suitable for small and medium-sized series
- Disadvantages:
  - High material consumption (sprue waste)
  - Secondary finishing of the parts is required (to remove the sprue)
  - Not suitable for fast-curing systems (risk of premature curing in the runners)

Direct Gating

In this case the material in the cold runner is injected into the part. A cold runner with needle valve offers additional processing advantages, such as low shearing during injection.

- Advantages:
  - Articles do not require secondary finishing
  - High degree of automation possible
  - Low material consumption (no sprue waste)
  - Can also be used for rapid curing systems
- Disadvantages:
  - Expensive mold design/ production
  - Higher costs for multicavity molds (a cold runner for each cavity) is required

Comparison: Indirect and Direct Gating via Cold Runner



Vulcanization

The curing temperatures and times depend on the quality of the heating system and on the material, volume and geometry of the rubber part. ELASTOSIL® liquid silicone rubber is usually processed at between 150 and 200 °C.

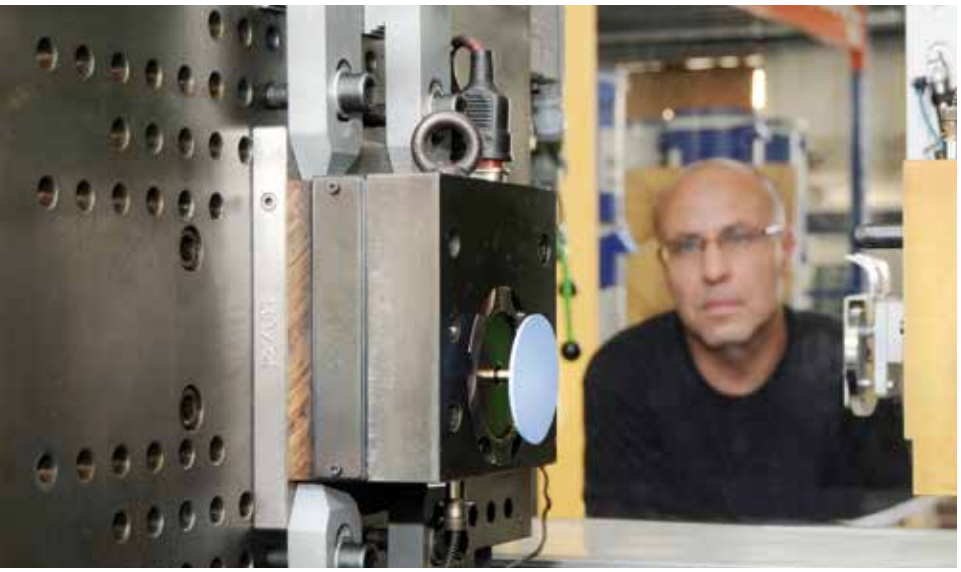
ELASTOSIL® Solid Silicone Rubber

In general, it offers the same advantages as liquid silicone rubber. However, due to the higher viscosity, the runner cross-sections are generally larger.

Curing

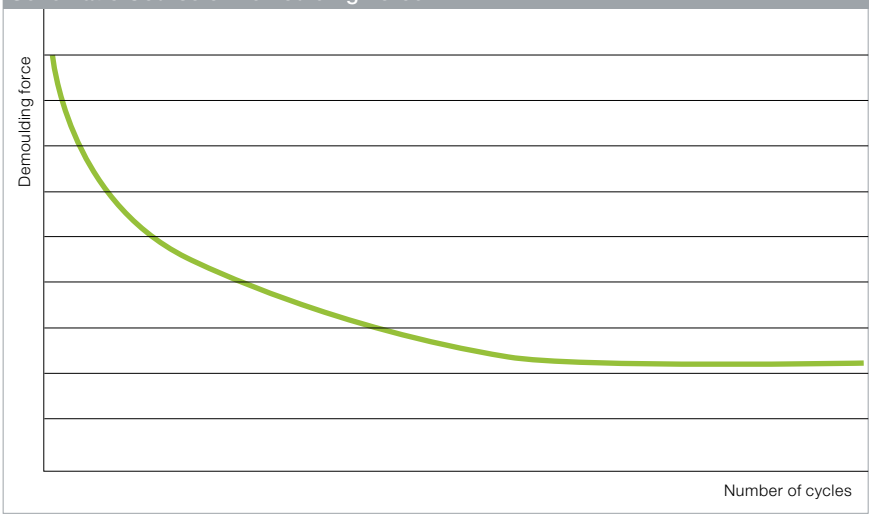
Solid silicone rubber is processed at between 150 and 200 °C.

5.4
INJECTION MOLDING
DEMOLDING



Demolding an injection molded sheet from the mold

Schematic Course of Demoulding Force



Vulcanized silicone rubber tends to stick to the mold wall. This can be solved in various ways.

Multiple Process Passes

Demolding may be more difficult at the beginning of the process. After multiple cycles, a release layer resulting from the silicone rubber forms on the mold surface, and assists in demolding (cf. diagram).

Mold Release Agents

The use of mold release agents, e. g. ELASTOSIL® Mold Release Agent 32, aids demolding on process startup.

Auxiliary Equipment

The parts are generally demolded by means of ejector pins and brush or blower units.

5.4
INJECTION MOLDING
2K INJECTION MOLDING

Multicomponent parts can be manufactured by 2K injection molding.

- Soft-hard combinations (combinations of silicone rubber with thermoplastic or metal parts)
- Silicone rubber/silicone rubber combinations (e. g. color combinations or combinations of grades with different hardnesses)

Advantages of 2K Injection Molding

- Excellent adhesion of the components
- Greater scope for designers (color combinations, etc.)
- Soft or non-slip surfaces can be produced in one step
- Outstanding sealing, e. g. against dust or condensation

Material Selection

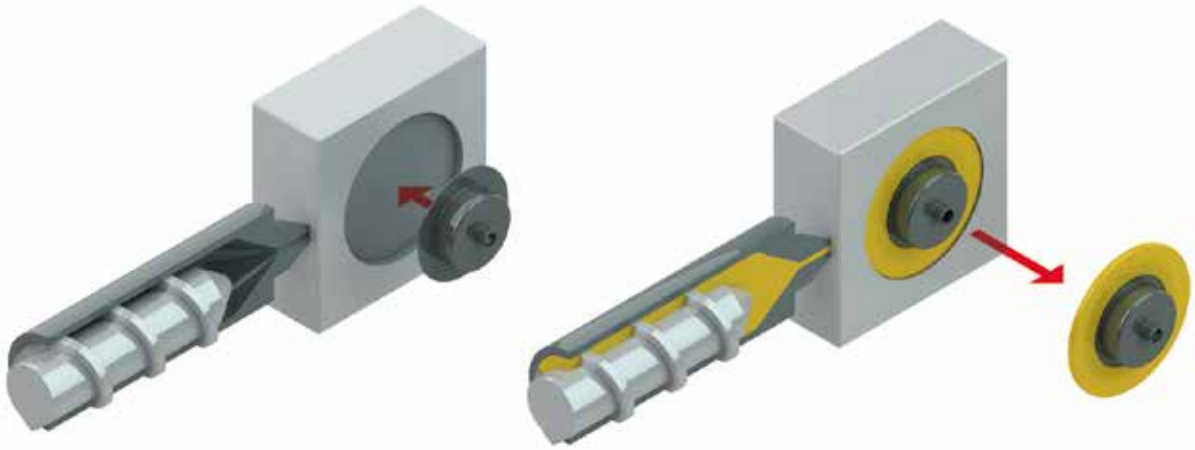
WACKER offers self-adhesive ELASTOSIL® silicone rubber. For more information, see our CD-ROM (product selector) and the product overview leaflets.

Process Options

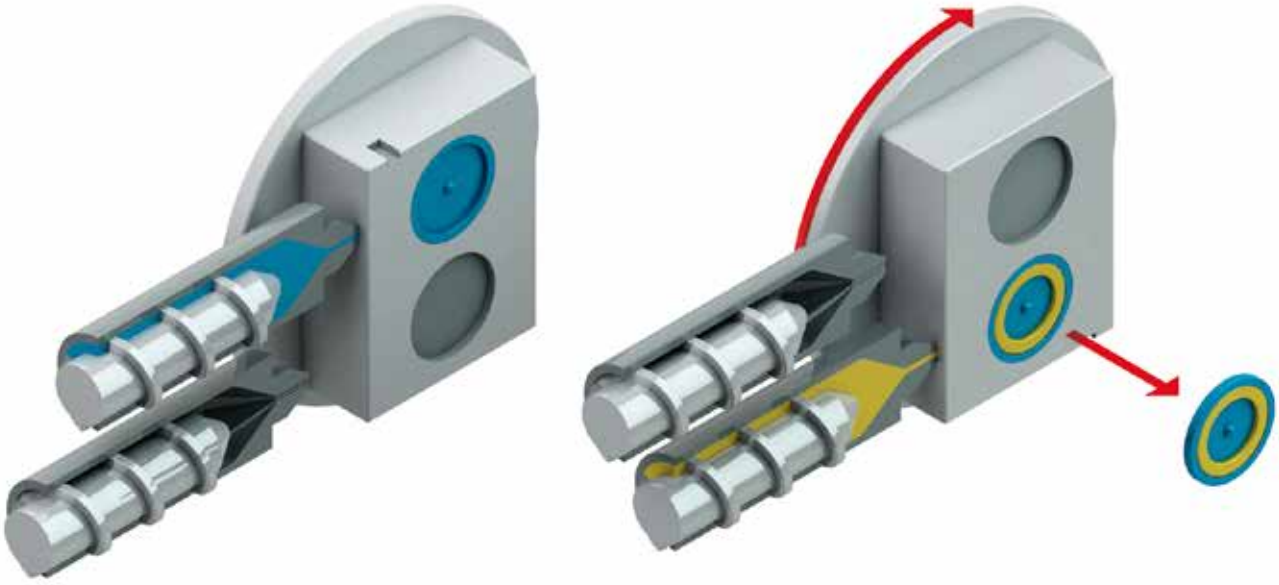
Combination parts can be produced by different processes.

- Insert process:
  Prefabricated hard components (thermoplastics, glass or metal) are inserted in the cavity on a 1K injection molding machine and then overmolded with ELASTOSIL® liquid silicone rubber. Before insertion, metals should be degreased with a solvent such as ethanol or acetone. With thermoplastics, ensure that they have been properly dried, since adsorbed moisture leads to poor adhesion. With difficult material combinations, adhesion can be assisted by, e. g. flame, corona or plasma treatment.
- 2K injection molding on one injection molding machine:
  A 2K injection molding machine with rotary table produces combination parts in one step. In the first position, the parts are molded from thermoplastic. The moldings are then transferred to position 2 on the turntable, where they are overmolded with liquid silicone rubber.
- 2K injection molding on two injection molding machines:
  This is a two-stage process with two machines: the thermoplastic backing part is molded on the first machine in a thermoplastic mold. While the part is still hot, a gantry robot transfers it to a silicone mold on the second machine, where it is overmolded with liquid silicone rubber.

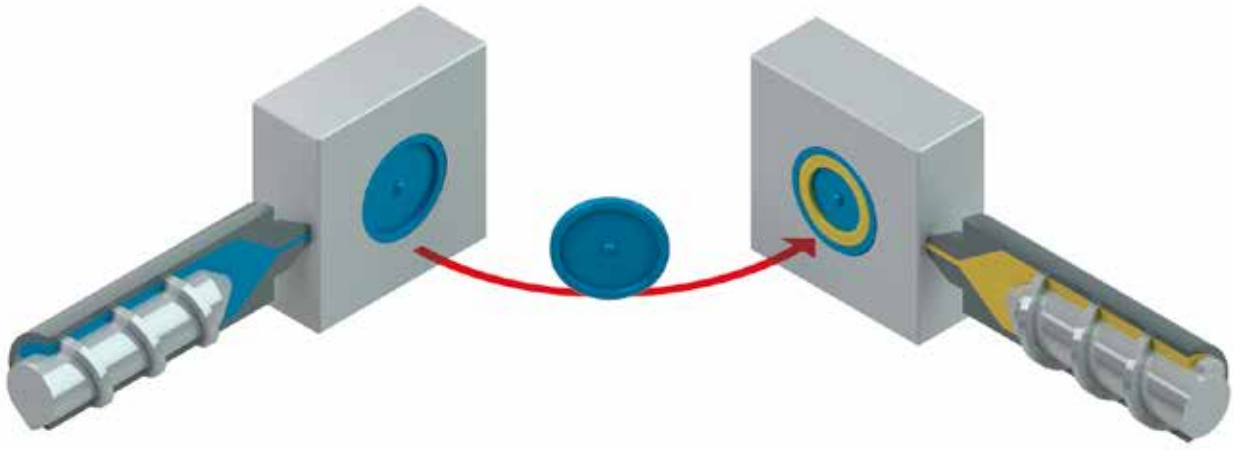
Diagram Comparing the Different 2K Injection Molding Methods



Insert process



2K injection molding on one injection molding machine



2K injection molding on two injection molding machines

5.4
INJECTION MOLDING
TROUBLESHOOTING

Troubleshooting					
	Symptoms				
	Moldings not fully crosslinked	Overpacking/flash	Mold adhesion/ parts not demoldable	Air inclusions/ bubbles	Burn marks/ white spot
Possible Causes					
Mold temperature too low	●	●			
Mold temperature too high				●	●
Mold has excessive undercuts			●		
Mold surface too smooth			●		
Inadequate mold balancing (cold runner/manifold)					●
Mold defective		●			
Heating time too short	●			●	
Clamping force too low		●			
Inhomogeneous temperature distribution in the mold					
Inadequate deaeration/ vacuum				●	●
Injection too fast		●		●	●
Injection too slow					
Nonreturn valve faulty					
Holding pressure too high/ too long		●			
Too little material					
Switchover point to holding pressure incorrect		●			
Deviations in mixing ratio of the components	●		●		
Poor material mixing	●				
Faulty shut-off valve on material feed					
Air in the material feed				●	

Weld seam	Part deformation/ scorching	Defects in the molding	Irregular mold filling	Fluctuations from shot to shot	Underfilling	Sink marks
●	●				●	
			●		●	
						●
	●		●	●		●
●		●			●	●
●	●	●				
	●	●				
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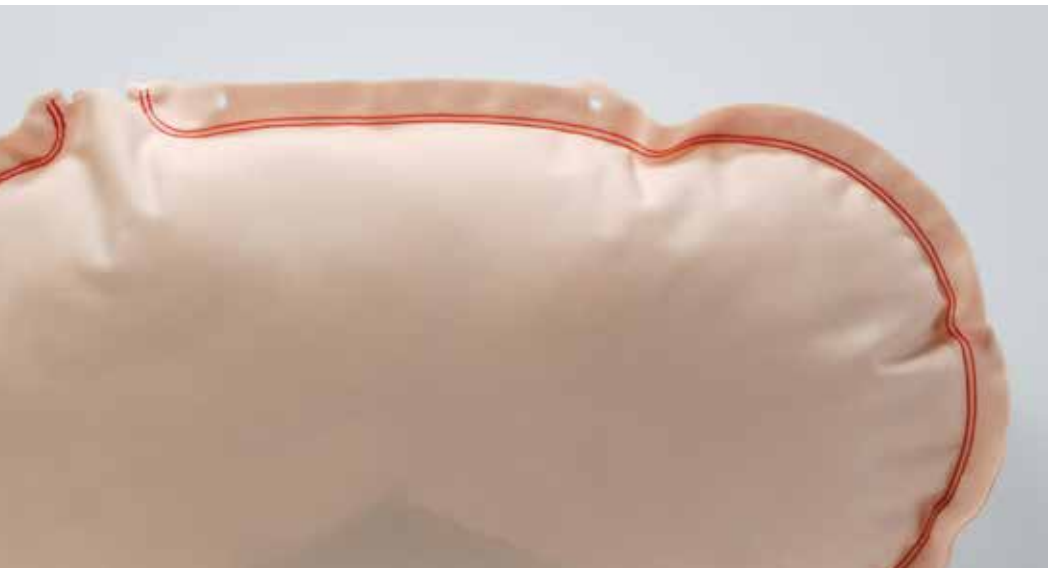
5.5
TEXTILE COATING



Airbags are coated with ELASTOSIL® silicone rubber to ensure their proper function

ELASTOSIL® silicone rubber is used for coating many materials. Different surface effects are produced on paper, film, plastics and metals. Textile coatings are an important application.

At present, textiles are made from a variety of materials, such as glass, polyesters, polyamides, cotton, wool, silk or metal fibers. They are also produced in different forms, such as wovens, nonwovens, scrims, knitteds.

Purpose of Coating

Silicone rubber increases the functionality of textiles, imparting specific technical properties.

Possible Properties

- Thermal resistance from –50 °C to +250 °C
- Physical properties such as increased tear strength and abrasion resistance
- Chemical resistance to liquids and microorganisms
- Weathering resistance and resistance to UV-B and UV-C radiation
- Water repellent or waterproof properties
- Washing and dry-cleaning resistance
- Surface properties from sticky to non-stick
- Thermal and electrical properties from insulating to conductive
- Adhesion properties from non-stick to adhesive
- Color: from transparent to a variety of pigments

Paragliders are coated with ELASTOSIL® silicone rubber to protect the fabric against weathering and UV radiation

Material Selection

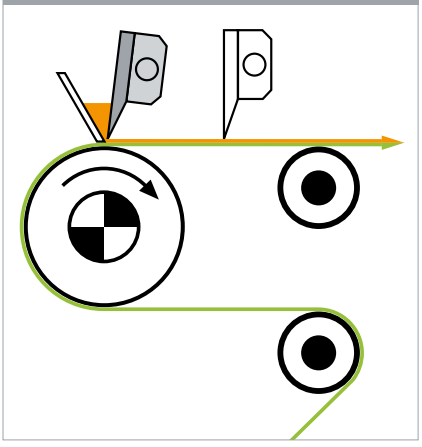
For coating textiles, there are a number of ELASTOSIL® grades that can be used:

- Solvent-based ELASTOSIL® silicone rubber dispersions
- Solvent-free addition-curing ELASTOSIL® liquid silicone rubbers
- Condensation-curing ELASTOSIL® 1K silicone rubbers and condensation or addition-curing ELASTOSIL® 2K silicone rubbers
- ELASTOSIL® silicone resins (solvent-based, solvent-free, water-based)
- Water-based, condensation-curing ELASTOSIL® 1K silicone rubber dispersions and addition-curing ELASTOSIL® 2K silicone rubber dispersions

Coating Techniques

Blade coating is the technique primarily used. Extrusion and dip coating or any other conventional methods can also be used.

Schematic Representation of the Blade Coating Process



SECTION 6:
SECONDARY FINISHING

Contents

Secondary finishing of cured silicone rubber

6.1.
POST-CURING

Ideally, silicone rubber articles do not need secondary finishing. But in many cases the material must be post-cured. That involves heating at a high temperature for a defined time.

Why is Post-Curing Necessary?

Post-curing is performed to achieve an improvement in the mechanical properties (e.g. a particularly low compression set), and to remove volatiles (by-products from the crosslinker chemicals and low-molecular polymer components). For e.g. food-contact applications, post-curing is recommended or even essential in order to meet legal requirements.

- Peroxide-curing rubber:
  Post-curing serves principally to eliminate by-products from the peroxide curing reaction. When ELASTOSIL® AUX Crosslinker E is used, by-products migrate to the cured rubber surface over several hours, and can be seen as white crystal deposits on the surface (blooming). In the case of ELASTOSIL® AUX Crosslinker C1 or C6, the by-products impart a characteristic odor to the cured rubber, which can be removed by post-curing.
- Addition-curing platinum-catalyzed rubber:
  In this case, curing does not form odor containing by-products. But post-curing is still recommended if the silicone article is intended for use in sensitive areas, such as food-contact or medical applications. In such cases the relevant recommendations FDA[1] or BfR[2] or E.P. 3.1.9[3] must be followed.

Removing Defects

Other work steps may be necessary in the following cases:

- Correcting flash or defects (cryogenic deflashing or sanding down)
- Removing sprue waste and talc

Our experts will be glad to help you set up your production plant to manufacture products that meet your demands, and eliminate unnecessary production steps, e.g. by means of test series in our pilot plant or on-the-spot advice.

[1] FDA Chapter 21 CFR § 177.2600 Rubber Articles Intended for Repeated Use.
[2] BfR recommendation XV. Silicones.
[3] E.P. 3.1.9: European Pharmacopeia 5.0, Chapter 3.1.9.

Ideally, cured ELASTOSIL® silicone rubbers are free of flash and ready to use with no further production steps

The Right Way to Post-Cure

- Fresh-air supply:
  Carry out post-curing in a circulating-air oven with a fresh air supply. The volatile components consist predominantly of flammable low-molecular siloxanes and maybe peroxide by-products, which must be removed from the oven during post-curing. To ensure reliable operation, fresh air must be supplied at a rate of 100 – 120 l/min/kg of silicone to prevent a risk of deflagration (observe the explosion limits). Most of the volatile components escape in the first 2 hours. Ensure good ventilation during this time.

- Inserting the cured parts:
  Place the parts on a perforated plate or wire mesh, if possible without their touching each other, so that they are not deformed by their inherent weight. To avoid unrestricted air flow, do not place parts one inside the other. Coil up tubes or profiles. In the production of cables, the cable drums should be wound loosely. Single rods between the layers ensure that air can circulate through the cable drum.

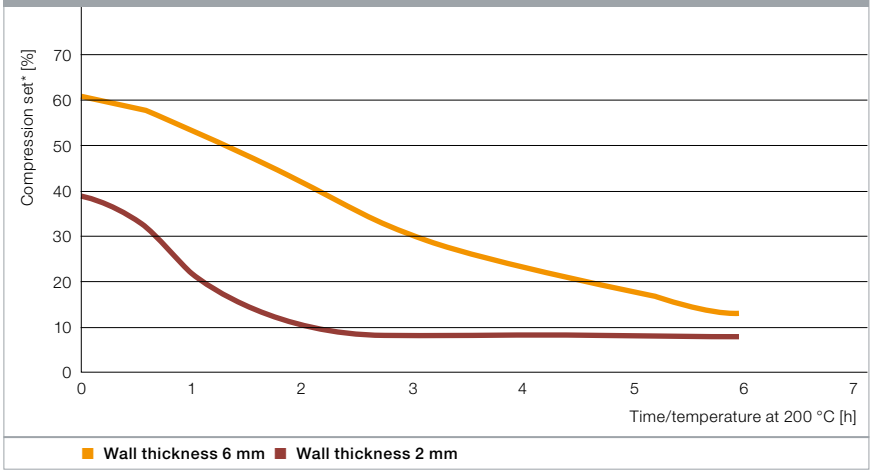
- Temperature/time:
  Perform tests to assure the optimum conditions for your part. Check the volatiles content by measuring the weight loss[1]. The required post-curing time increases with the layer thickness. Sheets 2 mm thick generally require 4 hours at 200 °C. The temperature profile, too, depends on the thickness of the parts: the thicker the part the lower the starting temperature and the slower the temperature is increased. Following the heating-up phase, post-curing should be conducted for at least 4 hours at 200 °C. Never exceed 225 °C or a post-curing time of 8h, since this can lead to undesirable thermal aging of the material and embrittlement. Besides thermal aging, an oxygen deficiency can also cause undesirable reversion (degradation of crosslinks) and the formation of unwanted formaldehyde. Check regularly that the oven is operating at constant conditions (e.g. constant temperature).

Important!

Never post-cure platinum-curing grades in contact with peroxides or their degradation products. The presence of such substances in the ventilation air can affect the basic properties of the rubber. Avoid contact with volatile components of organic rubber to prevent cross contamination. Clean the post cure ovens and exhaust system regularly, and replace the pipes in certain intervals.

[1] BfR tests require drying over calcium chloride prior to weight loss determination.

Influence of Post-Curing Time on Compression Set of ELASTOSIL® LR 3003/50 at Various Wall Thickness



* Measurement of compression set at 22h/175 °C in compliance with DIN ISO 815-B

Post-Curing for Technical Applications

Post-curing can also be used to achieve particular technical properties. For example, the compression set of cured ELASTOSIL® silicone rubber depends very significantly on the post-curing time. In the case of ELASTOSIL® LR 3003/50, non-post-cured products have a compression set of 60 – 70%, which can be improved by post-curing. The non-post-curing grades ELASTOSIL® LR 3005, ELASTOSIL® LR 3015, ELASTOSIL® LR 3065 and ELASTOSIL® R 701 are designed for a particularly low compression set even without post-curing. However, they are generally restricted to use in technical applications.

ELASTOSIL® AUX Crosslinker E and Stabilizer R

- Many HTV extrusion grades (e.g. for window profiles) do not need to be post-cured if Stabilizer R is added to the silicone rubber. The stabilizer prevents the blooming of by-products in ELASTOSIL® AUX Crosslinker E and improves the compression set.
- Large-volume parts require post-curing and the addition of Stabilizer R. Here, incomplete migration of dichlorobenzoic acid, a primary by-product of ELASTOSIL® AUX Crosslinker E, chemically ages the rubber by acid attack from the rubber bulk (softening it). Stabilizer R binds the by-products and significantly restricts this reaction.

WACKER has developed a new process for thermal post-treatment of silicone moldings. Lower energy demand, reduced emissions and high inherent safety are the advantages of the new vacuum post-curing process.

New Vacuum Post-Curing Method

- Thermal treatment takes place under substantially reduced pressure
- The air inside the furnace is continually washed with cold water
- The two flowing media, air and water, circulate
- The water powers a water ring pump, which generates a vacuum inside the system and drives the air flow
- A centrifugal pump ensures water flow

Advantages of Vacuum Post-Curing over Conventional Method

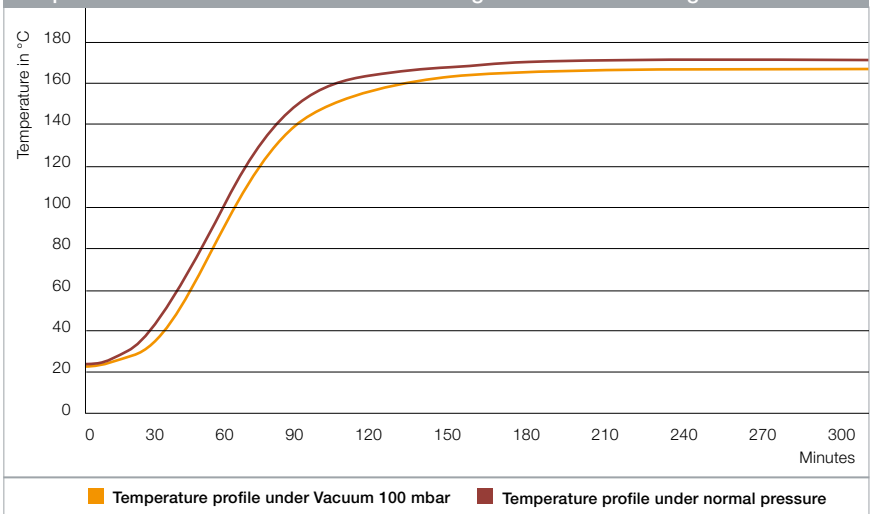
- Low energy requirement
  The air volume flow to be heated is significantly less than for the conventional procedure –> over 20% reduction in energy requirement
- Lower emissions
  The air circulating in the system can be so heavily loaded with volatile silicone components that these can be washed out –> emissions can be reduced by 70 – 90%
- High inherent safety
  – The system is generally operated at a pressure of 100 mbar –> at a pressure of less than 150 mbar, no flammable mixture of volatile silicone components and air forms
  – The furnace door/lid does not lock mechanically, but is vacuum-sealed during evacuation; should the vacuum
  fail, the lid opens by itself once standard pressure has been reached

First test results indicate that vacuum post-curing provides results equal to those of the conventional process regarding e.g. mechanical properies or remaining volatile content.

Acquisition costs for the vacuum system are comparable to the investment costs of purchasing a conventional post-curing system.

A Wacker Chemie AG patent is pending for the process. A Wacker Chemie AG pilot plant at the Burghausen site can be reserved for post-curing tests

Temperature Profile in a Silicone Block* during Vacuum Post-Curing



At a vacuum of 100 mbar, heat transfer is still sufficient

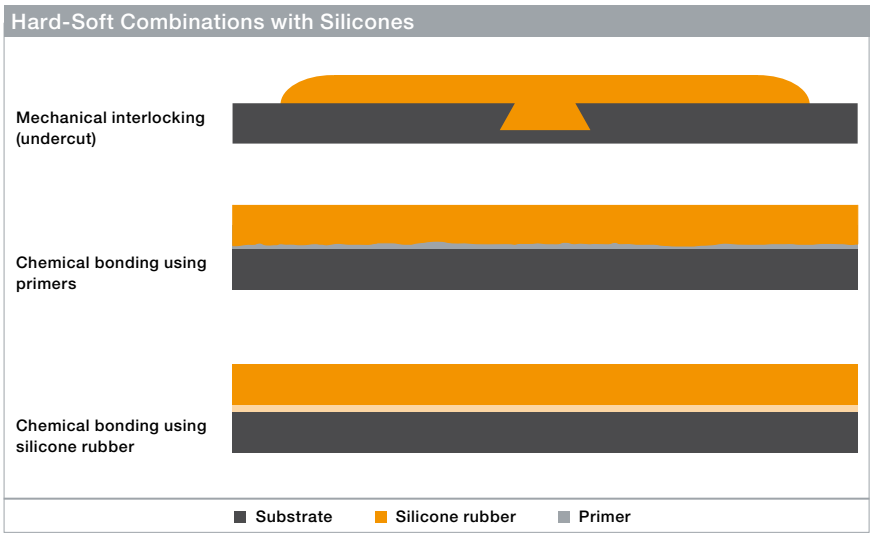
License Partner for Oven Construction

Eberl Trocknungsanlagen GmbH
Contact: Roland Feuerecker,
roland.feuerecker@eberl-trocknungsanlagen.de,
+49 (0)87459644616

The company has extensive experience in vacuum systems for drying wood and will tailor the vacuum post-curing system exactly to customer requirements in terms of size and configuration.

*Rectangular block with 90 x 100 mm diameter

6.2
MULTICOMPONENT TECHNIQUES



Silicone rubber can bond either mechanically or chemically to other substrates. The mechanical bond is produced by interlocking, for example by overmolding of openings or undercuts in the hard component. Chemical bonding generally offers several advantages: there are various ways of achieving this.

Chemical Bonding Techniques

Chemical bonding techniques include:

- Use of self-adhesive silicone rubber
- Vulcanizing onto a primer-treated substrate
- Bonding of premolded individual parts
- Chemical (e.g. priming), physical (e.g. plasma) or mechanical treatment of the substrate surface

Advantages of Chemical Bonding

Chemical bonding generally offers price and performance advantages:

- Lower mechanical loading
- Lower tendency of the bond to fatigue
- Lower weight
- Bonds and seals simultaneously
- Can be bonded to shock-sensitive substrates (e.g. glass)
- Can be bonded to electrochemically sensitive metals
- Usually relatively cost effective

6.2
MULTICOMPONENT TECHNIQUES
SELF-ADHESIVE SILICONE RUBBER

Injection molding machine for 2K materials

Self-adhesive silicone rubber grades such as ELASTOSIL® R *plus* 4070 or ELASTOSIL® LR 3070 adhere directly to a substrate during vulcanization.

Adhesion to metals such as steel, aluminum or brass is generally very good. The same applies to many thermoplastics and thermosets. Silane-based products are generally used in the rubber as internal adhesion promoters. They are compatible with the uncured rubber but incompatible with the cured rubber, and therefore diffuse to the surface during vulcanization, forming a chemical bond.

Injection Molding

The following processing methods can be used here (for details, see section 5, pages 56 – 57):

- Insertion process
- 2K process on an injection molding machine
  - Mold with rotary table
  - Transfer within the mold by a handling robot
- 2K injection molding process with two IM machines
  - Two different molds linked via a handling robot

Extrusion

For extrusion applications, coextrusion can be used to produce extrudates from different materials in one step (for details, see section 5, page 46).

Advantages

The advantages of self-adhesive silicone rubbers ELASTOSIL® R *plus* and LR are especially clear:

- Only one step (no application of primer, no cleaning of the substrate, no undercuts)
- Rapid curing and therefore short contact time with the mold
- Easily demoldable, even from uncoated steel
- Rapid build-up of adhesion strength to the substrate
- No adhesion to the mold

Please nNote

- Always check that the silicone rubber is compatible with the substrate (metal, glass, PA, PBT, PET, etc.)
- The melting point of the substrate should be as high as possible
- Extensive information about tested material combinations and adhesion values is available from our technical service. We will be pleased to perform tests in house on your behalf

6.2 MULTICOMPONENT TECHNIQUES
PRIMER/ADHESIVE

Grundierungen				
Grundierung	**Dynamic viscosity in mPa•s**	**Special Characteristics**	**Suitable for**	**Recommended coating technique**
ELASTOSIL® AUX Grundierung G 790	1	General purpose	Platinum curing rubber	Spraying
ELASTOSIL® AUX Grundierung G 791	4000	Silicone-to-Silicone bonding	Platinum curing rubber	Brushing or dipping
ELASTOSIL® AUX Grundierung G 3241	600	Electrically conductive	Peroxide curing rubber	Spraying or brushing
ELASTOSIL® AUX Grundierung G 3242	5	General purpose	Peroxide curing rubber	Spraying
ELASTOSIL® AUX Grundierung G 3243	550	General purpose	Peroxide curing rubber	Spraying or brushing
ELASTOSIL® AUX Grundierung G 3244	300	Red Color	Peroxide curing rubber	Spraying or brushing
ELASTOSIL® AUX Grundierung G 3246	2600	General purpose	Peroxide curing rubber	Brushing or dipping

ELASTOSIL® AUX PRIMERS G serve as adhesion promoters between silicone elastomers and other substrates like metals, glass and thermoplasts. ELASTOSIL® AUX PRIMERS G are solvent based and contain a mixture of reactive silanes and siloxanes.

Special Characteristics

- Provide excellent adhesion onto various substrates.
- Solvent based - Different viscosities available for various coating techniques like dipping, brushing or spraying.
- Further dilution in organic solvents possible.

Application

ELASTOSIL® AUX PRIMERS G are used to pretreat metallic, ceramic, glass or other polymeric substrate surfaces to enable excellent adhesion towards subsequent vulcanized ELASTOSIL® R, R *plus* or LR silicone elastomers.

Step by Step

- The substrate to be primed must be dry and free of grease, oils or other contaminants. Very smooth surfaces must be roughened, for example thoroughly cleaned by sandblasting or with glass beads, and degreased with solvents such as white spirit or acetone
- Apply primer by spraying, dipping or brushing (thin coat with no bubbles). For absorbent surfaces, repeat priming several times
- Dry primed metal parts in air for at least 15 minutes
- Store the pretreated surfaces in a clean and dust-free place for maximum 24 hours drying time
- So that the primer film is not damaged by high shearing forces during vulcanization, in the case of large-area coatings and for the production of rollers or rubberized metal parts by injection molding, the primer should be baked in the press. For example: 20 to 40 minutes at 100 to 140 °C.

Please Note

Primers are based on moisture-sensitive compounds. Therefore, only open the containers briefly during processing and do not return residues to the vessel.

6.2 MULTICOMPONENT TECHNIQUES BONDING OF PREMOLDED INDIVIDUAL PARTS

Grundierungen		
Adhesive	**Dynamic viscosity in mPa•s (Brookfield)**	**Special Characteristics**
ELASTOSIL® E43	350.000	General purpose
ELASTOSIL® E43 N	300.000	For food contact applications
ELASTOSIL® E47	non-slump	Fast curing at elevated temperatures
ELASTOSIL® N10	10.000	General purpose
ELASTOSIL® N199	non-slump	General purpose
SILPURAN® 4200	300.000	For medical applications

WACKER supplies one and two-component room-temperature-curing systems for bonding vulcanized silicone rubber parts or bonding silicone rubber to other substrates.

One-Component Adhesive

One-component room-temperature-vulcanizing (RTV-1) silicone rubber compounds are supplied ready to process in tubes, cartridges and pails. The compounds cure on exposure to atmospheric moisture. ELASTOSIL® E 43 N is a solvent-free, heat-resistant transparent adhesive that does notuse tin-containing catalysts. ELASTOSIL® E 41 is a toluene-containing one-component dispersion that is easier to handle due to its improved flow properties. However, ELASTOSIL® E 43 N is better for large-area bonding of relatively thin silicone rubber parts. The warping caused by the swelling effect of toluene can be avoided in this case.

- Step by step:
  - Clean the rubber parts or substrate carefully and degrease if necessary
  - Apply the silicone rubber 1-component adhesive (RTV-1) to a thickness of at least 0.5 mm
  - Miter cut the ends of cords or profiles obliquely before bonding to give the biggest possible bonding area
  - Press together the parts to be bonded and fix them in position until the adhesive has cured
  - Depending on the air humidity, the optimum bond strength at room temperature is achieved within 12 to 15 hours. It is much faster at temperatures between 50 and 100 °C and high humidity

Two-Component Systems

Two-component systems are an economically attractive alternative for larger production runs and large-area bonds. They cure rapidly even under lower air exposure.

- Step by step:
  - Apply the paste thinly to the cut surface and fix the bond in position under pressure
  - Cure by direct heating, with a hot-air gun or in a drying cabinet
  - The time depends on the heating method and thermal capacity of the parts to be bonded. At about 170 °C, the bond cures within 20 to 30 seconds

Bonding of Metal

- ELASTOSIL® E one-component silicone rubber compounds release acetic acid when they cure causing corrosion to some metals
- Therefore, pretreat metals with primer G 790; the primer also improves adhesion
- With very corrosion-sensitive metals, we recommend using amine-curing or neutral systems

6.3
COATING AND PRINTING SILICONE ARTICLES

Cured ELASTOSIL® silicone rubber can be refined in a number of different ways.

There are Several Possibilities:

For example, the following properties can be further influenced by secondary surface treatment:

- Abrasion resistance
- Dirt repellency
- Haptic properties and structure
- Chemical resistance
- Electrical conductivity
- Thermal conductivity
- Electrostatic charging, and many others

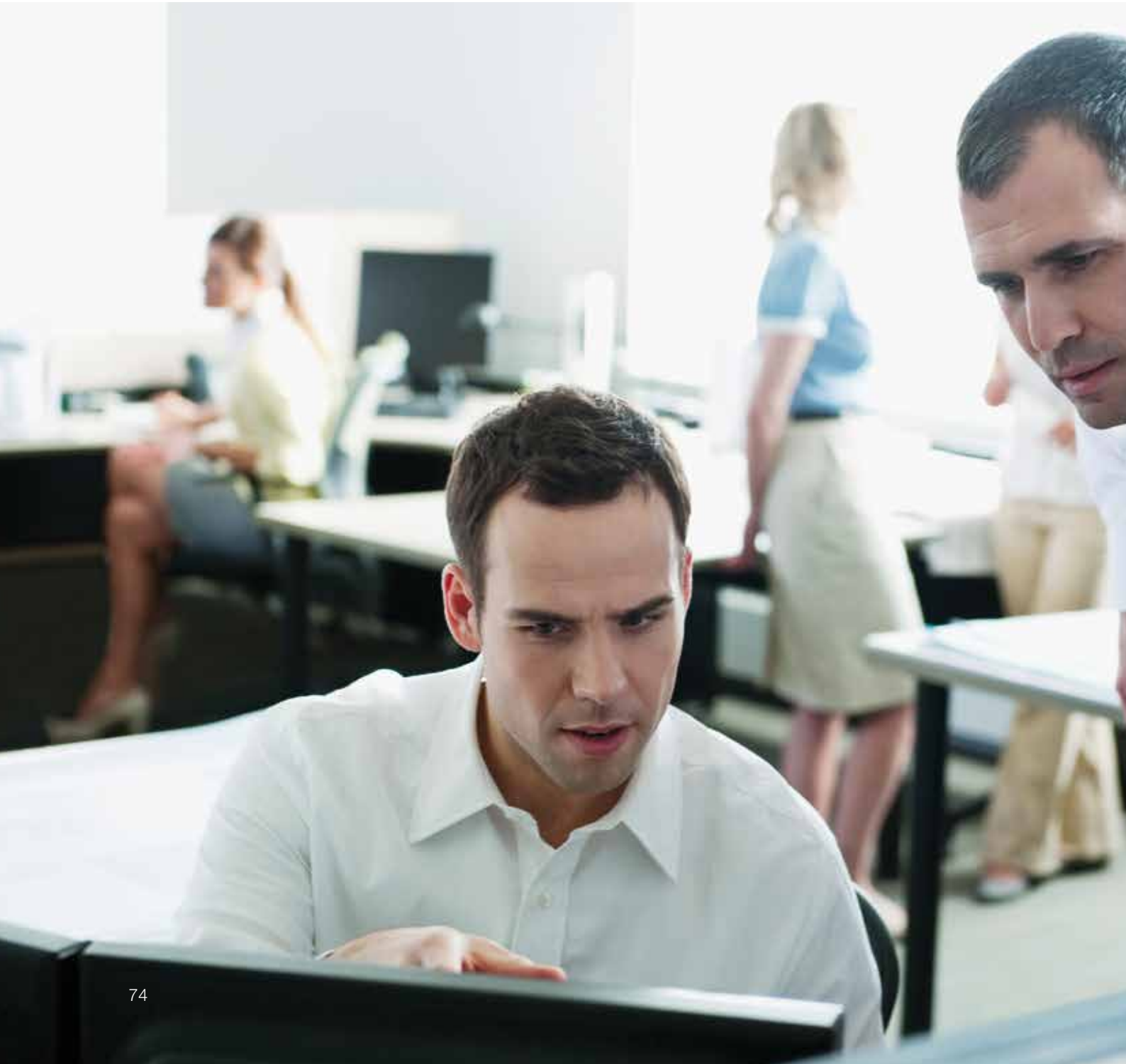
Processes and Products

Typical coating processes include knife coating, spraying or printing. Suitable products include ELASTOSIL® RTV-1 silicone rubber, ELASTOSIL® RTV-2 silicone rubber and ELASTOSIL® and SILPURAN® liquid silicone rubber.

Ask Us!

If you have any questions on this topic, please ask your sales manager. He will be glad to show you the many possibilities and give you specific advice about the product.

SECTION 7:
SERVICE



Contents

How we support you along the entire process chain

7.1.
TECHNICAL SUPPORT AND ADVICE

What we Offer

- Preliminary material selection tests
- Production of two-component samples especially for adhesion testing and other test purposes
- Extruding profiles, tubing, round strands, cables of different geometries and silicone rubber materials for test purposes
- In-site production of prototypes and sample series using the client's own tooling for screening tests, approval or subsequent use by the end customer
- Joint development of specific products
- Training and instruction
- System consulting, particularly process design and utilization of machines/tooling in new applications and projects
- In-site process optimization
- Analysis and simulation of problems occurring in processing and production
- Individual problem solving and ensuring process stability

We offer you technical support at various levels to ensure the success of our products at every stage in your process chain.

Technical Centers

We maintain technical centers in all key regions to assist you in any technical matters. From adjusting formulations to individual requirements, to property testing of rubber compound and cured material. The technical centers are equipped to perform all relevant analytical techniques and lab tests for you according to international and local standards and regulations. You have access not only to our locally based experts but also to our globally networked knowledge from over 50 years of market experience.

For example, our pilot plant in Burghausen forms the interface between product and applications expertise. It is equipped with a lab and test facilities, as well as production systems (extrusion and injection molding) for HTV and LSR silicone rubber, and 2K combinations. At our pilot plant, we put our ELASTOSIL® product series through a range of practical tests as part of their development, testing, modification and optimization. At the same time, we offer extensive advice at every step in the supply chain, and put our pilot plant and all the necessary tools at your disposal. Or we work on your premises at your production plant.

Applications Labs

For technical support, our application chemists work closely with our customers, dealing with specific questions from the field. We will support you by finding the optimum product for your specific requirements and supporting your product development from material selection through to industrial production – worldwide. Our laboratories deal with key issues from specific industrial sectors (such as medical and automotive applications and cables). They have thereby built up special expertise and know-how in these application fields.

Some of our Services

- Technical consultancy for product selection to your specific requirements
- Joint development of specific products
- Testing the chemical resistance of materials
- Thermal storage tests
- Providing samples and sheet samples
- Color matches
- Advice on questions about material processing

7.2.
SILMIX®: CUSTOM SILICONE RUBBER COMPOUNDS

With SILMIX®, we offer you ready-to-use silicone rubber compounds tailored to your specifications.

Flexible and Globally Represented

At our SILMIX® plants at various sites around the world, we develop custom compounds to your specifications.

Direct and Versatile

Our ready-to-process SILMIX® products allow you to manufacture a wide variety of silicone rubber articles directly by various processes, such as pressing, transfer molding, injection molding and extrusion. Applications range from automotive gaskets, through cable insulation, to rubber-coated rolls for photocopiers.

Best Quality

SILMIX® compounds are manufactured to the same quality standards as all WACKER silicone rubber grades. Thanks to its integrated silicon production system, WACKER is highly backward-integrated and produces the necessary raw materials itself, from the polymer base upwards. This ensures highly consistent good quality.

Interested?

You can find further information on the accompanying CD-ROM and on our website: www.wacker.com/silmix

7.3.
WACKER INFOLINE E-BUSINESS

Infoline

To make it easier for you to get into rapid personal dialog, we have set up an info hotline for you. For all questions concerning silicone rubbers from WACKER, our products and services, just call us or send us an email: you will be redirected to a specialist who can answer your questions.

Europe and the Middle East
- Infoline Germany: 0800 – 6279 – 800
- International Infoline: +49 89 6279-1741
- Email: info@wacker.com

NAFTA region – Canada, Mexico and USA
- Infoline: +1 888 -922-5374 (+1 888-WACKER 4 U)
- Email: info.usa@wacker.com

E-Business

WACKER e-solutions simplify communication with customers and suppliers, and offer many new possibilities: from global searches to expedited order processing via the web platform or Hub2Hub, to vendor managed inventory – just as you wish. We compile a tailored service package for you. Exactly tailored to the size of your company, your profile and the wishes of each contact.

You can gain considerably greater efficiency through:
- “Clean orders”
- Fewer order changes
- Faster processing with a greatly reduced proportion of errors
- Maximum planning reliability and
- Full transparency

WACKER e-solutions support you exactly where human error is most common. However, they supplement rather than replace human interactions, by bringing the right people together. Our partners value the direct line to our experts in R&D, supply chain management, sales support and technical customer service.

And you can
- Call up any industry and product information you want
- Order easily, quickly and reliably – 24/7
- Carry out paperless invoicing
- Automatically process all orders
- Automatically check and complete your inventories

7.4.
REGULATORY SUPPORT

To ensure product safety, we – of course – offer you regulatory support. Our experts will deal with your enquiries about environmental, health and regulatory matters.

This includes, for example, the following topics:

- Food contact applications (e.g. BfR, FDA)
- Drinking water approval (e.g. KTW, WRAS, ACS)
- Pharmaceutical and medical applications (e.g. European Pharmacopeia and U.S. Pharmacopeia USP)
- National and international regulations and provisions (e. g. EU directive 2002/95/EC – RoHS, REACH)
- Requirements of specific industries (e.g. GADSL, IMDS, automotive industry)
- Specific customer requirements (e.g. banned-substance and substance-avoidance lists)
- Toxicology and ecotoxicology
- Risk assessment
- Organizational assistance

Just Ask Us!

Call us if you have any questions about food approvals, REACH or other regulatory issues. Please ask our sales managers first, who are your direct contacts. They will pass your questions on to our experts and send you our reply to your specific question!

7.5.
THE WACKER ACADEMY

To transfer its own expertise and market experience, WACKER has founded a unique institution, the WACKER ACADEMY. Here, at a number of sites worldwide, you can take advantage of a versatile, industry-specific seminar program.

This includes:
- Introductory chemistry seminars
- Training programs on particular application fields
- Introductory seminar on silicone rubber for newcomers to the field
- General seminars, e.g. on intercultural communication or innovation management

You can find the current program at: www.wacker.com/wacker-academy. The WACKER ACADEMY is headquartered at our largest production plant, which is in Burghausen, Germany. Further WACKER ACADEMY centers located in different regions exemplify our policy of making global expertise available right on your doorstep. As a result, we can offer you a seminar program that is tailored to you and your specific markets.

All our seminars are held by experienced specialists – chiefly in-house experts. To make our program even more attractive and ensure it remains up to date, we work closely with universities and research institutes.

SECTION 8:
RUBBER SOLUTIONS A–Z
FACTS AND FIGURES ABOUT SILICONE

Contents

A list of frequently used technical terms is given below.

8.
RUBBER SOLUTIONS A–Z
FACTS AND FIGURES ABOUT SILICONE

Coefficient of Expansion
- Linear thermal coefficient of expansion of tool steel is approx. 1.5 10^{-6} K^{-1}, and leads to shrinkage of the final parts.
- Typical values: approx. 2 - 4 · 10^{-4} K^{-1}.

Compression Set
- Determination of the compression set as per ISO 815-B (ASTM D395 B-2) by storage for 22h/175 °C, or 22h/125 °C in the case of self-adhesive grades.
- Compression set describes the elastic recovery of a cured rubber, an important characteristic for gasket applications.
- Typical values for silicone rubber: 5 – 25%.

Density
- Determination as per ISO 1183-1 A (buoyancy method).
- Typical range for specific density 1.05 – 1.60 g/cm^3.
- When using additional inactive fillers (e.g. quartz), values up to 1.75g/cm^3 can be achieved, e.g. to improve swelling resistance.

Dielectric Constant ε
- Determination of dielectric constant ε as per DIN 53 482 or VDE 0303.
- Typical values for silicone rubber: ε = 2.7 - 3.3 (at 25 °C and 50 Hz).
- This property can be increased up to 150 by the use of suitable fillers.

Dielectric Strength
- Determination of dielectric strength per IEC 60243-1.
- Typical value for ELASTOSIL® silicone rubber > 20 kV/mm (measured on a 1 mm sheet).

Dissipation Factor Tan δ
- Determination of the dissipation factor as per VDE 0303.
- Typical values for loss angle tan δ ~ $10^{-3.}$
- tan δ is raised by increasing the filler content/density.

Fire Behavior
- The auto-ignition temperature of cured products is about 430 °C.
- Silicone rubber burns to form a white non-toxic ash of silicon dioxide
- The resultant combustion gases are usually non-corrosive.
- Specialty grades for high-safety cables form a ceramic layer in the case of fire.

Flame Resistance
- Determination of the flame resistance acc. to test standard ASTM D 2863 by determining the limiting oxygen index (LOI) or acc. to Underwriters Laboratory fire standard (UL 94).
- Typical LOI values of flame retardant grades 27 to 35%
- Standard grades normally achieve UL 94 HB (0.5 – 1.0 mm thickness*)
- Specialty grades with additives reach UL 94 V0 (1.0 – 4.0 mm thickness*).
- In the case of solid silicone rubber, the addition of 2.2% ELASTOSIL® AUX Batch SB-2 improves the flame resistance considerably.

* dep. on grade

Gas Permeability

- Determination as per DIN 53 536
- Very high gas permeability compared to other elastomers, e.g. for air 30 times higher than for natural rubber (NR) or 400 times higher than butyl rubber (IIR) (measured at 25 °C)
- The absolute value of a 50 Shore A grade for air at 20 °C and 80 °C is 570 and 1.330 $cm^3 \cdot mm \cdot m^{-2} \cdot h^{-1} \cdot bar^{-1}$ (volume of air measured in cm^3, that penetrates a membrane of 1 m^2 area per hour at a pressure difference of 1 bar and 1 mm thickness)
- Technical advantage, e.g. for contact lenses, textile coatings and for some medical applications
- At high temperatures, silicone has similar values to organic elastomers

Hardness

- Determination of the hardness of silicone rubber in Shore A (DIN 53 505) or in IRHD units (DIN 53 519).
- Typical bandwidth 3 – 90 Shore A.

Just Ask Us!

Gas	relative permeability at 25 °C [%]
Air	100
Hydrogen	190
Oxygen	170
Nitrogen	80
Carbon dioxide	1.000
Ethylene	390

High-Energy Radiation

- Outstanding resistance of silicone rubber (VMQ, PVMQ) to high-energy radiation in combination with hot-air resistance in comparison to other elastomers.
- With VMQ silicone rubber grades, only high radiation doses of 400 – 800 kGy lead to a reduction of 50% in the elongation at break.
- Phenyl-containing PVMQ silicone rubber, such as ELASTOSIL® R 490/55, has higher resistance.
- Properties not severely affected by gamma and beta radiation (25 – 75 kGy), as widely used for sterilization of medical equipment.
- Very good resistance to microwaves, since silicone parts are not microwave-active and therefore not heated.

Hot-Air Resistance

- The mechanical properties of WACKER silicone rubber are retained even at high temperature loading (hot air).
- The hot-air resistance is thereby clearly superior to that of most organic elastomers (cf. ASTM Charta D2000)

Ozone resistance

- Outstanding resistance of silicone rubber to ozone
- Determining ozone resistance as per DIN 53509
- For selected products of the ELASTOSIL® R 401 and ELASTOSIL® LR 3003 series, a cracking level of 0 was obtained after 96h at an ozone concentration of 200 pphm (temperature: 40 °C, r.h. 55%, elongation 80%)

Rebound Resilience

- Determination of rebound resilience as per DIN 53 512
- Also commonly known as “snap”
- Measured on 6 mm samples as a ratio of rebound height to the drop height of a pendulum
- Typical values 30 – 70%.

Reversion

- By reversion is meant in general degradation of the crosslinking network in the cured rubber as a result of chemical or thermal effects, which leads to a permanent decrease of hardness (softening)
- In silicone rubber, at high temperatures (> 200 °C) traces of moisture or free hydroxyl groups in fillers cause cleavage of the Si-O bond in the polymer chain and ultimately the above-mentioned decrease in hardness due to depolymerization
- This process is inhibited by the presence of air
- High heat resistance therefore requires unrestricted access of atmospheric oxygen, and must be taken into account in the design of gasket parts
- In the case of thick parts, where oxygen diffusion is difficult, this process is inhibited by the use of Stabilizer R.

Solvent and Chemical Resistance

- The chemical resistance of WACKER silicone rubber generally depends on the crosslinking density, filler used, and filler content.
- With higher filler levels in the silicone rubber, swelling tendency decreases and resistance is therefore improved.
- High swelling tendency to non-polar liquids such as hydrocarbons, mineral oils and greases.
- Low swelling tendency to polar liquids, such as polyhydric alcohols, low-molecular ketones, and therefore no negative effect on seal quality.
- Strongly attacked by concentrated acids and alkalis, particularly by oxidizing acids such as sulfuric or nitric acid.
- Silicone rubber has good resistance to aqueous solutions of weak acids, alkalis or salts, which are commonly used as cleaning solutions for lines / tubing at 70 – 80 °C in the food industry.

Shrinkage

- Linear shrinkage of approx. 2 – 4% falls with increasing Shore hardness and lower vulcanization temperature
- The higher the filler content or density, the less is the shrinkage of the cured parts.
- Very strong dependency on processing parameters and material grades
- For precision parts, fine tuning is necessary by means of preliminary tests.

Surface Resistence

- Determination of the surface resistivity per VDE 0303
- Typical values for insulating ELASTOSIL® LR compounds: approx. 10^{12} – 10^{13} Ω.

Tear Propagation and Notch Resistance

- Tear strength depends on which particular standard is used.
- Typical values when determined as per ASTM D 624 B (crescent): 5 – 55 N/mm.
- Values are up to 30% lower when measured by ISO 34-1, method B-b (Graves).
- ISO 34-1 method A (trouser) yields values about 50% lower.

Tear Strength and Elongation at Break

- Determination as per DIN 53 504
- Standard test on S1 bar. In exceptional cases also measurements on small S2 and S3 test specimens, though the values deviate correspondingly
- Typical values for tensile strength: approx. 5 – 12 N/mm^2 (or MPa) Typical values for elongation at break: approx. 100 – 1.100%

Temperature Behavior

- Mechanical properties of silicone elastomers determined at 23 °C (RT) as per DIN 53503 or DIN 53505 respectively.
- The change in the mechanical properties is only small compared to organic elastomers. ASTM D2000.
- Typical service temperature range: –50 to +250 °C.
- The material hardens at very low temperatures (–40 °C) due to reversible crystallization.
- There is a slow increase in hardness at very high temperatures (> 200 °C) as a result of heat aging.
- At high temperatures (> 180 °C), the organic side groups attached to the silicon atom undergo free-radical cleavage. The resulting free radicals cause post-curing of the polymer chains, with an increase in hardness together with a decrease of tensile strength and elongation at break (embrittlement).
- The simultaneous weight decrease of the vulcanizate leads to shrinkage.
- The lifetime of the vulcanizate can be increased by the use of heat stabilizers H1 – H6 (usually oxides of multi-valent elements).
- The increased crosslinking density as a result of prolonged thermal loading has a positive effect on the rebound resilience.
- Excellent stable long-term behavior for insulation at high temperatures is obtained, as oxidative degradation produces quartz-like properties.

Thermal Conductivity and Specific Heat Capacity

- Determined as per DIN 52 612
- The thermal conductivity depends on the type and amount of fillers used.
- Typical value at 100 °C: approx. 0.2 – 0.3 $W \cdot m^{-1} \cdot K^{-1}$.
- Special thermally conductive compounds achieve values of about 0.1 – 1.2 $W \cdot m^{-1} \cdot K^{-1}$.
- Typical values for specific heat capacity: approx. 1.25 $kJ \cdot kg^{-1} \cdot K^{-1}$.

Tracking Resistance

- Silicone rubber generally features high tracking resistance (CTI: 600 - <1 as per IEC 60112).

Volume Resistivity

- Determination as per VDE 0303
- Typical values for insulating silicone rubber grades approx. 10^{15} Ω · cm.
- Typical values for conductive grades approx. 2 - 150 Ω · cm.
- Lower temperature dependency in the case of platinum-catalyzed grades compared to peroxide-cured systems.

Water and Steam Resistance

- Excellent resistance to boiling water.
- Volume decrease in boiling water below 1%, even after prolonged action.
- Resistance to superheated steam is higher for elastic grades than for notch-resistant grades.
- Steam sterilization (as per ISO 17665, DIN EN 868-8 at 500 cycles at 134 °C, 5min.) leads to only a slight worsening of mechanical properties.

Weathering and UV Resistance

- Silicone rubber articles are generally insensitive to UV radiation.
- Properties only change slightly even in long-term tests (several years of weathering).
- Unlike with organic elastomers, weathering resistance can be achieved without additives (e.g. organic antioxidants, UV stabilizers, etc.).

EXPERTISE AND SERVICE NETWORK ON FIVE CONTINENTS

• Sales and production sites, plus 20 technical centers, ensure you a local presence worldwide.

WACKER is one of the world's leading and most research-intensive chemical companies, with total sales of €4.91 billion. Products range from silicones, binders and polymer additives for diverse industrial sectors to bio-engineered pharmaceutical actives and hyperpure silicon for semiconductor and solar applications. As a technology leader focusing on sustainability, WACKER promotes products and ideas that offer a high value-added potential to ensure that current and future generations enjoy a better quality of life based on energy efficiency and protection of the climate and environment. Spanning the globe with five business divisions, operating 25 production sites, WACKER is currently active in over 100 countries. The Group maintains subsidiaries and sales offices in 29 countries across Europe, the Americas and Asia – including a solidly established presence in China. With a workforce of 17,200, WACKER sees itself as a reliable innovation partner that develops trailblazing solutions for, and in collaboration with, its customers. WACKER also helps them boost their own success. Our technical centers employ local specialists who assist customers worldwide in the development of products tailored to regional demands, supporting them during every stage of their complex production processes, if required. WACKER e-solutions are online services provided via our customer portal and as integrated process solutions. Our customers and business partners thus benefit from comprehensive information and reliable service to enable projects and orders to be handled fast, reliably and highly efficiently. Visit us anywhere, anytime around the world at: **www.wacker.com**

All figures are based on fiscal 2011.

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6709e/11.12 replaces 6709e/05.11

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67090 e/09.13 replaces 67090 e/11.12

PRODUCT OVERVIEW

PEROXIDE CURING SOLID SILICONE RUBBER

Multi-purpose · High green strength · High tear resistance

Main characteristics	Brand	Product	Hardness Shore A DIN 53505	Specific gravity [g/cm³] DIN 1183-1A	Tensile strength [N/mm²] DIN 53 504-S1	Elongation at break [%] DIN 53 504-S1	Tear resistance [N/mm] ASTM D 624 B	Compression set [%] (22 h/175 °C) DIN ISO 815-B	Data obtained with curing agent	Food contact – BfR [1]	Food contact – FDA [2]	Drinking water contact – KTW [3]	Drinking water contact – WRAS	Molding	Extrusion	Appearance	Typical applications
Multi-purpose	ELASTOSIL®	R 401/10 oH	13	1.07	6.0	1200	21	28	E	X	X				X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves)
	ELASTOSIL®	R 401/20 oH	24	1.11	9.0	920	26	33	E	X	X		X		X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves)
	ELASTOSIL®	R 401/30 S	30	1.10	9.0	880	32	20	C1	X	X		X	X		Transparent	Production of molded parts, e.g. seals, valves
	ELASTOSIL®	R 401/30 oH	34	1.09	10.0	720	22	20	E	x	X		X		X	Transparent	Production of extruded parts, e.g. tubes, cables or profiles
	ELASTOSIL®	R 401/40 S	42	1.12	10.0	580	23	36	E	X	X	X	X		X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves)
	ELASTOSIL®	R 401/50 S	52	1.15	11.0	520	25	34	E	X	X	X	X		X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves)
	ELASTOSIL®	R 401/55 S	55	1.14	11.0	470	23	35	E	X	X		X		X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves)
	ELASTOSIL®	R 401/60 S	61	1.15	11.0	440	24	31	E	X	X	X	X		X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves, spark plug boots)
	ELASTOSIL®	R 401/60 KX S	59	1.18	11.0	460	25		E	X	X	X	X		X	Transparent	Production of extruded parts, e.g. tubes, cables or profiles
	ELASTOSIL®	R 401/70 S	70	1.18	11.0	440	26	40	E	X	X	X	X		X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves, spark plug boots)
	ELASTOSIL®	R 401/80 S	79	1.20	10.0	420	26	57	E	X	X	X	X		X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves)
	ELASTOSIL®	R 401/90 oH	85	1.22	8.0	260	23	50	E	X	X		X		X	Transparent	Production of extruded parts (tubes, cables, profiles) or molded articles (seals, valves)
	ELASTOSIL®	R 780/80 oH	80	1.74	6.0	70	8	15	E	X	X				X	Beige	Masterbatch for compounding inert fillers
	CENUSIL®	R 140	42	1.11	7.2	400	14	8	C6					X		Translucent	Production of molded parts, e.g. keypads
	CENUSIL®	R 150	51	1.13	7.9	315	14	10	C6					X		Translucent	Production of molded parts, e.g. keypads
	CENUSIL®	R 160	62	1.17	9.1	310	17	10	C6					X		Translucent	Production of molded parts, e.g. keypads
	CENUSIL®	R 170	70	1.19	9.1	290	18	12	C6					X		Translucent	Production of molded parts, e.g. keypads
High green strength	ELASTOSIL®	R 402/60 S	62	1.17	10.0	490	34	31	E	X	X	X	X		X	Transparent	Production of extruded parts, e.g. precision profiles and dimensionally accurate tubes
	ELASTOSIL®	R 402/65 oH	67	1.17	11.0	430	24	32	E	X	X		X		X	Transparent	Production of extruded parts, e.g. precision profiles and dimensionally accurate tubes
	ELASTOSIL®	R 402/75 S	74	1.19	9.0	490	29	62	E	X	X		X		X	Transparent	Production of extruded parts, e.g. precision profiles and dimensionally accurate tubes
	ELASTOSIL®	R 416/70 mH	70	1.18	10.0	570	30	20	C1						X	Black, red	Calendering and extrusion, e.g. production of turbo charger and radiator hoses
	ELASTOSIL®	R 760/70 mH	70	1.17	10.5	480	27	10	C1						X	Black, red	Calendering and extrusion, e.g. production of turbo charger hoses
High tear resistance	ELASTOSIL®	R 420/30 oH	31	1.10	8.0	670	26	28	E	X	X		X		X	Transparent	Production of extruded or molded parts with excellent tear resistance
	ELASTOSIL®	R 420/40 S	43	1.12	9.0	630	34	34	E	X	X		X		X	Transparent	Production of extruded or molded parts with excellent tear resistance
	ELASTOSIL®	R 420/50 S	52	1.15	10.0	600	39	36	E	X	X		X		X	Transparent	Production of extruded or molded parts with excellent tear resistance
	ELASTOSIL®	R 420/60 S	59	1.17	10.0	580	42	39	E	X	X		X		X	Transparent	Production of extruded or molded parts with excellent tear resistance
	ELASTOSIL®	R 420/70 S	66	1.19	9.0	650	48	63	E	X	X		X		X	Transparent	Production of extruded or molded parts with excellent tear resistance

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

[1] BfR recommendation XV (silicones); (BfR = Bundesinstitut für Risikobewertung).
[2] FDA CFR 21 § 177.2600 "Rubber articles intended for repeated use" (FDA = Food and Drug Administration).
[3] Categories on request.
Please contact us for in-depth technical consulting to select the right product for your individual demands.
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67/0D e/09.13 replaces 67/0D e/11.12

PRODUCT OVERVIEW

PEROXIDE CURING SOLID SILICONE RUBBER

Media resistant · High rebound resilience · Low temperature resistance · High heat resistance · Electrically conductive · Flame retardant · Low rebound resilience · Superheated steam resistance · High elasticity · Magnetisable

Main characteristics	Brand	Product	Hardness Shore A DIN 53505	Specific gravity [g/cm³] DIN 1183-1A	Tensile strength [N/mm²] DIN 53 504-S1	Elongation at break [%] DIN 53 504-S1	Tear resistance [N/mm] ASTM D 624 B	Compression set [%] (22 h/175 °C) DIN ISO 815-B	Data obtained with curing agent	Food contact - BfR [1]	Food contact – FDA [2]	Drinking water contact – KTW [3]	Drinking water contact – WRAS	Molding	Extrusion	Appearance	Typical applications
Media resistant	ELASTOSIL®	R 701/40	39	1.10	6.9	457	14	7	C1					X		Opaque	Production of industrial molded parts, e.g. rollers or seals and gaskets in contact with oil
	ELASTOSIL®	R 701/50	49	1.16	7.7	452	14	7	C1					X		Beige	Production of industrial molded parts, e.g. rollers or seals and gaskets in contact with oil
	ELASTOSIL®	R 701/60	58	1.24	7.5	353	18	8	C1					X		Beige	Production of industrial molded parts, e.g. rollers or seals and gaskets in contact with oil
	ELASTOSIL®	R 701/70	70	1.29	7.7	285	16	10	C1					X		Beige	Production of industrial molded parts, e.g. rollers or seals and gaskets in contact with oil
	ELASTOSIL®	R 701/80	81	1.39	7.7	190	17	18	C1					X		Beige	Production of industrial molded parts, e.g. rollers or seals and gaskets in contact with oil
	ELASTOSIL®	R 805/75 oH	80	1.36	6.4	170	15	17	C1					X		Beige	Production of molded parts with good resistance against motor oil / aggressive mineral oils
High rebound resilience	ELASTOSIL®	R 101/25 oH	23	1.07	6.0	900	15	11	C1	X	X			X		Translucent	Production of molded parts, e.g. damping elements
	ELASTOSIL®	R 101/35 oH	35	1.09	8.0	700	16	10	C1	X	X			X		Translucent	Production of molded parts, e.g. damping elements for engine mounts
	ELASTOSIL®	R 101/45 oH	47	1.10	8.0	540	18	10	C1	X	X			X		Translucent	Production of molded parts with excellent long-term stress durability, e.g. damping elements for engine mounts
	ELASTOSIL®	R 101/65 oH	65	1.13	8.0	200	16	10	C1	X	X			X		Translucent	Production of molded parts with excellent long-term stress durability, e.g. damping elements for engine mounts
Low temperature resistance	ELASTOSIL®	R 490/55 oH	50	1.17	11.0	500	33	39	E	X	X				X	Transparent	Production of extruded or molded parts with very good low temperature resistance
High heat resistance	ELASTOSIL®	R 750/40 oH	39	1.12	10.6	630	25	30	E						X	Transparent	Production of extruded parts with good resistance to dry heat
	ELASTOSIL®	R 756/50 oH	50	1.14	8.5	500	24	18	C1	X	X					Transparent	Optimized for high temperatures
	ELASTOSIL®	R 756/60 oH	60	1.16	8.5	400	27	10	C1	X	X			X	X	Transparent	Extruded or molded parts with excellent heat resistance
	ELASTOSIL®	R 756/70 oH	70	1.16	9.0	380	22	17	C1	X	X			X	X	Transparent	Extruded or molded parts with excellent heat resistance
Electrically conductive	ELASTOSIL®	R 570/30 oH	33	1.10	4.1	800	27		C1					X		Black	Production of electrically conductive molded parts (volume resistivity 5.2 Ω cm)
	ELASTOSIL®	R 570/50 oH	49	1.12	6.7	370	16	37	C1					X		Black	Production of electrically conductive molded parts (volume resistivity 6.2 Ω cm)
	ELASTOSIL®	R 570/60 oH	63	1.14	7.3	240	14	32	C1					X		Black	Production of electrically conductive molded parts (volume resistivity 3.5 Ω cm)
	ELASTOSIL®	R 570/70 oH	71	1.23	6.4	160	13	29	C1					X		Black	Production of electrically conductive molded parts (volume resistivity 3.7 Ω cm)
Flame retardant	ELASTOSIL®	R 770/50 oH	46	1.14	9.4	690	40		E						X	White	Applications with high demands on fire safety, e.g. door profiles in trains or floor profiles in airplanes
	ELASTOSIL®	R 770/60 oH	65	1.40	4.1	400	15	38	E						X	White	Applications with high demands on fire safety, e.g. door profiles in trains or floor profiles in airplanes
	ELASTOSIL®	R 770/75 oH	75	1.56	4.1	220	16	39	E						X	White	Applications with high demands on fire safety, e.g. door profiles in trains or floor profiles in airplanes
Low rebound resilience	ELASTOSIL®	R 752/30 oH	33	1.15	7.9	930	33	30	C1	X	X			X		Translucent	Production of molded parts with good damping properties, e.g. vibration damping elements in the automotive industry
	ELASTOSIL®	R 752/50 oH	50	1.18	8.5	830	32	38	C1	X	X			X		Translucent	Production of molded parts with good damping properties, e.g. vibration damping elements in the automotive industry
	ELASTOSIL®	R 752/70 oH	70	1.23	9.6	560	27	39	C1	X	X			X		Translucent	Production of molded parts with good damping properties, e.g. vibration damping elements in the automotive industry
Superheated steam resistance	ELASTOSIL®	R 755/60 oH	61	1.18	7.8	320	16	20	C1					X		Opaque	Production of molded parts with good resistance to steam
High elasticity	ELASTOSIL®	R 861/60 S	56	1.16	8.3	370	16	16	E	X	X				X	Translucent	Production of extruded or molded parts, e.g. seals with low compression set
	ELASTOSIL®	R 861/70 S	69	1.20	8.9	300	18	20	E	X	X				X	Translucent	Production of extruded or molded parts, e.g. seals with low compression set
Magnetisable	ELASTOSIL®	R 781/80	79	2.33	3.3	51	15		E	X	X			X	X	Black	Production of magnetic profiles

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

[1] BfR recommendation XV (silicones); (BfR = Bundesinstitut für Risikobewertung).
[2] FDA CFR 21 § 177.2600 "Rubber articles intended for repeated use" (FDA = Food and Drug Administration).
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ELASTOSIL®

PRODUCT OVERVIEW

LIQUID SILICONE RUBBER

Multi-purpose · High tear resistance ·
Media resistance · Heat resistance

Main characteristics	Brand	Product	Further characteristics	Hardness Shore A DIN 53505	Specific gravity [g/cm³] DIN 1183-1A	Tensile strength [N/mm²] DIN 53 504-S1	Elongation at break [%] DIN 53 504-S1	Tear resistance [N/mm] ASTM D 624 B	Compression set [%] (22 h/175 °C) DIN ISO 815-B	Food contact - BfR [1]	Food contact - FDA [2]	Drinking water contact - KTW [3]	Drinking water contact - WRAS	Flame retardancy - UL 94 Listing	Cure system	Appeareance	Typical applications
Multi-purpose	ELASTOSIL®	LR 3003/03		3	1.00	1.0	630	3	11						Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/05		6	1.05	2.5	700	8	12						Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/10 TR		12	1.07	4.1	740	15	13				X	HB (0.5 mm)	Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/20 TR		20	1.08	8.0	860	26	18	X	X		X	HB (0.5 mm)	Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/30		30	1.09	7.5	620	23	10	X	X	X	X	HB (0.5 mm)	Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/40		42	1.13	10.0	610	33	13	X	X	X	X	HB (0.5 mm)	Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/50		50	1.13	9.9	480	29	13	X	X	X	X	HB (0.5 mm)	Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/60		60	1.13	9.4	340	27	11	X	X	X	X	HB (0.5 mm)	Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/70		70	1.14	8.6	290	21	13	X	X	X	X	HB (0.5 mm)	Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/80		76	1.16	8.0	210	18	13	X	X	X	X	HB (0.5 mm)	Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3003/85		84	1.15	6.0	120	12	14	X	X				Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. seals, valves, gaskets, membranes, O-rings
	ELASTOSIL®	LR 3004/30	Fast cure	30	1.10	7.4	620	26	9	X	X	X	X	HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3004/40	Fast cure	41	1.13	10.0	610	32	11	X	X	X	X	HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3004/50	Fast cure	49	1.13	10.0	480	29	13	X	X	X	X	HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3004/60	Fast cure	58	1.13	9.6	380	25	13	X	X	X	X	HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3004/70	Fast cure	69	1.15	9.0	290	24	15	X	X	X	X	HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3005/30	Low comp. set, npc [4], fast cure	31	1.10	6.0	612	18	15					HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of technical molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3005/40	Low comp. set, npc [4], fast cure	40	1.12	7.8	610	22	16					HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of technical molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3005/50	Low comp. set, npc [4], fast cure	50	1.13	9.4	520	24	14					HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of technical molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3005/60	Low comp. set, npc [4], fast cure	60	1.14	10.0	400	29	13					HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of technical molded parts, e.g. seals, O-rings, valves, gaskets, membranes
	ELASTOSIL®	LR 3005/70	Low comp. set, npc [4], fast cure	70	1.15	9.0	350	31	13					HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Economic production of technical molded parts, e.g. seals, O-rings, valves, gaskets, membranes
High tear resistance	ELASTOSIL®	LR 3040/30	Fast cure, high tear	31	1.12	8.8	710	35	18	X	X				Platinum (1:1 A/B)	Transparent	Economic production (fast cure) of molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	LR 3040/40	Fast cure, high tear	42	1.12	9.3	610	37	13	X	X				Platinum (1:1 A/B)	Transparent	Economic production (fast cure) of molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	LR 3040/45	Fast cure, high tear	45	1.13	9.5	580	38	12	X	X				Platinum (1:1 A/B)	Transparent	Economic production (fast cure) of molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	LR 3040/50	Fast cure, high tear	49	1.12	9.0	480	40	11	X	X				Platinum (1:1 A/B)	Transparent	Economic production (fast cure) of molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	LR 3040/60	Fast cure, high tear	60	1.13	8.6	350	36	22	X	X				Platinum (1:1 A/B)	Transparent	Economic production (fast cure) of molded parts
	ELASTOSIL®	LR 3040/70	Fast cure, high tear	70	1.13	8.2	350	40	20	X	X				Platinum (1:1 A/B)	Transparent	Economic production (fast cure) of molded parts
	ELASTOSIL®	LR 3043/40	High tear	40	1.14	10.0	650	36	25	X	X				Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	LR 3043/50	High tear	50	1.13	9.1	460	43	25	X	X				Platinum (1:1 A/B)	Transparent	Production of molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	LR 3043/60	High tear	60	1.14	8.8	360	43	20	X	X				Platinum (1:1 A/B)	Transparent	Production of molded parts
	ELASTOSIL®	LR 3043/70	High tear	70	1.14	8.9	280	25	22	X	X				Platinum (1:1 A/B)	Transparent	Production of molded parts
Media resistance	ELASTOSIL®	LR 3015/50	Oil resistant, less abrasive, low comp. set, npc [4]	50	1.35	5.1	460	14	18						Platinum (1:1 A/B)	Beige	Technical parts e.g. valves, seals and O-rings in contact with oil
	ELASTOSIL®	LR 3015/70	Oil resistant, less abrasive, low comp. set, npc [4]	70	1.34	6.0	280	18	16						Platinum (1:1 A/B)	Beige	Technical parts, e.g. valves, seals and O-rings in contact with oil
	ELASTOSIL®	LR 3022/60	Coolant resistant	63	1.11	5.4	270	14	7						Platinum (1:1 A/B)	Opaque	Technical parts, e.g. valves, seals and O-rings in contact with coolant
	ELASTOSIL®	LR 3023/60	Low comp. set, npc [4], coolant resistant	60	1.12	5.5	300	15	11						Platinum (1:1 A/B)	Opaque	Technical parts, e.g. valves, seals and O-rings in contact with coolant
	ELASTOSIL®	FLR 3900/40	Fluorosilicone, fuel- and oil resistant, low comp. set, npc [4]	44	1.26	7.0	400	20	18 [5]						Platinum (1:1 A/B)	Translucent	Fabrication of molded parts with fuel and oil contact
	ELASTOSIL®	FLR 3900/60	Fluorosilicone, fuel- and oil resistant, low comp. set, npc [4]	62	1.26	7.0	260	18	13 [5]						Platinum (1:1 A/B)	Translucent	Fabrication of molded parts with fuel and oil contact
	ELASTOSIL®	FLR 3905/40	Fluorosilicone, fuel- and oil resistant, oil bleeding, low comp. set, npc [4]	40	1,24	5.0	310	12	13 [5]						Platinum (1:1 A/B)	Opaque	Fabrication of molded parts with fuel and oil contact
	ELASTOSIL®	FLR 3905/60	Fluorosilicone, fuel- and oil resistant, oil bleeding, low comp. set, npc [4]	60	1.27	5.0	300	19	18 [5]						Platinum (1:1 A/B)	Opaque	Fabrication of molded parts with fuel and oil contact
Heat resistance	ELASTOSIL®	LR 3092/65	Low comp. set	66	1.15	9.9	320	25	8					HB (0.5 mm)	Platinum (1:1 A/B)	Black	Post-cured technical parts in contact with high temperatures
	ELASTOSIL®	LR 3094/60	Low comp. set, npc [4]	60	1.14	10.0	400	30	12						Platinum (1:1 A/B)	Black	Non-post-cured technical parts in contact with high temperatures, spark plug boots

These figures are only intended as a guide and should not be used in preparing specifications.
A tighter specification regarding sh-A hardness can be possible for selected products on demand (+/-1, +/-2, +/-3).

[1] BfR recommendation XV (silicones); (BfR = Bundesinstitut für Risikobewertung).
[2] FDA CFR 21 § 177.2600 "Rubber articles intended for repeated use" (FDA = Food and Drug Administration).
[3] Categories on request.
[4] Non-post-cured.
[5] Compression set [%] (22 h/150 °C) DIN ISO 815-B.
Please contact us for in-depth technical consulting to select the right product for your individual demands.
Please contact us if you are interested in products with specific characteristics or if you need products from our basic portfolio in other hardnesses.

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6709F e 09.13 replaces 6709F e 11.12

PRODUCT OVERVIEW

LIQUID SILICONE RUBBER

Low coefficient of friction · Self-adhesion · Oil bleeding ·
Electrically conductive · High transparency · Flame retardant

Main characteristics	Brand	Product	Further characteristics	Hardness Shore A DIN 53505	Specific gravity [g/cm³] DIN 1183-1A	Tensile strength [N/mm²] DIN 53 504-S1	Elongation at break [%] DIN 53 504-S1	Tear resistance [N/mm] ASTM D 624 B	Compression set [%] (22 h/175 °C) DIN ISO 815-B	Food contact - BfR [1]	Food contact - FDA [2]	Drinking water contact - KTW [3]	Drinking water contact - WRAS	Flame retardancy - UL 94 Listing	Cure system	Appeareance	Typical applications
Low coefficient of friction	ELASTOSIL®	LR 3065/30	Low comp. set, npc [4], technical appl.	30	1.12	8.2	720	24	20					HB (0.5; 1.5; 3 mm)	Platinum (1:1 A/B)	Transparent	Technical molded parts with low coefficient of friction, e.g. weather packs, connector seals for the automotive industry
	ELASTOSIL®	LR 3065/50	Low comp. set, npc [4], technical appl.	50	1.13	9.0	480	29	15					HB (0.5; 1.5; 3 mm)	Platinum (1:1 A/B)	Transparent	Technical molded parts with low coefficient of friction, e.g. weather packs, connector seals for the automotive industry
	ELASTOSIL®	LR 3066/30	Food contact	31	1.10	7.8	620	32	15	X	X				Platinum (1:1 A/B)	Transparent	Molded parts with low coefficient of friction for food contact applications
	ELASTOSIL®	LR 3066/40	Food contact	40	1.12	8.9	550	34	14	X	X				Platinum (1:1 A/B)	Transparent	Molded parts with low coefficient of friction for food contact applications
	ELASTOSIL®	LR 3066/60	Food contact	60	1.13	8.8	350	27	18	X	X				Platinum (1:1 A/B)	Transparent	Molded parts with low coefficient of friction for food contact applications
	ELASTOSIL®	LR 3066/70	Food contact	70	1.13	7.9	265	21	17	X	X				Platinum (1:1 A/B)	Transparent	Molded parts with low coefficient of friction for food contact applications
	ELASTOSIL®	LR 3066/80	Food contact	80	1.14	6.0	130	13	14	X	X				Platinum (1:1 A/B)	Transparent	Molded parts with low coefficient of friction for food contact applications
Self adhesion	ELASTOSIL®	LR 3070/10	Adhesion on PA, PBT, PET, technical appl.	12	1.05	2.7	650	6	22 [5]						Platinum (1:1 A/B)	Transparent	Technical hard-soft composite parts (silicone on PA, PBT, PET), e.g. cable connectors
	ELASTOSIL®	LR 3070/20	Adhesion on PA, PBT, PET, technical appl.	20	1.08	6.3	780	17	35 [5]						Platinum (1:1 A/B)	Translucent	Technical hard-soft composite parts (silicone on PA, PBT, PET), e.g. cable connectors
	ELASTOSIL®	LR 3070/30	Adhesion on PA, PBT, PET, technical appl.	29	1.09	7.0	700	17	30 [5]					HB (0.75 mm)	Platinum (1:1 A/B)	Transparent	Technical hard-soft composite parts (silicone on PA, PBT, PET), e.g. cable connectors
	ELASTOSIL®	LR 3070/40	Adhesion on PA, PBT, PET, technical appl.	38	1.11	8,3	630	22	27 [5]				X		Platinum (1:1 A/B)	Transparent	Technical hard-soft composite parts (silicone on PA, PBT, PET), e.g. cable connectors
	ELASTOSIL®	LR 3070/50	Adhesion on PA, PBT, PET, technical appl.	52	1.10	8.0	450	20	18 [5]				X		Platinum (1:1 A/B)	Transparent	Technical hard-soft composite parts (silicone on PA, PBT, PET), e.g. cable connectors
	ELASTOSIL®	LR 3070/60	Adhesion on PA, PBT, PET, technical appl.	57	1.11	7.7	420	23	16 [5]				X		Platinum (1:1 A/B)	Transparent	Technical hard-soft composite parts (silicone on PA, PBT, PET), e.g. cable connectors
	ELASTOSIL®	LR 3071/30	Food contact	27	1.10	8.5	900	21	40 [5]	X	X				Platinum (1:1 A/B)	Transparent	Hard-soft composite parts (silicone on PA, PBT, PET) for food contact
	ELASTOSIL®	LR 3071/40	Food contact	39	1.11	7.6	610	21	40 [5]	X	X	X	X		Platinum (1:1 A/B)	Transparent	Hard-soft composite parts (silicone on PA, PBT, PET) for food contact
	ELASTOSIL®	LR 3071/50	Food contact	50	1.12	8.0	580	25	50 [5]	X	X	X	X		Platinum (1:1 A/B)	Transparent	Hard-soft composite parts (silicone on PA, PBT, PET) for food contact
	ELASTOSIL®	LR 3071/60	Food contact	60	1.12	8.5	500	28	53 [5]	X	X				Platinum (1:1 A/B)	Transparent	Hard-soft composite parts (silicone on PA, PBT, PET) for food contact
	ELASTOSIL®	LR 3072/30	Oil-exuding	32	1.10	7.5	680	16	24 [5]						Platinum (1:1 A/B)	Opaque	Hard-soft composite parts with oil-exuding properties, e.g. connector seals or weather packs for the automotive industry
	ELASTOSIL®	LR 3072/40	Oil-exuding	39	1.11	8.4	600	24	20 [5]						Platinum (1:1 A/B)	Opaque	Hard-soft composite parts with oil-exuding properties, e.g. connector seals or weather packs for the automotive industry
	ELASTOSIL®	LR 3074/60	Coolant resistant	58	1.14	6.8	360	16	16 [5]						Platinum (1:1 A/B)	Opaque	Hard-soft composite parts with coolant resistant properties, e.g. seals for the automotive industry
	ELASTOSIL®	LR 3076/50	Oil resistant, less abrasive	47	1.33	4.7	450	15	15 [5]						Platinum (1:1 A/B)	Beige	Hard-Soft composite parts with oil resistant properties, e.g. seals for the automotive industry
	ELASTOSIL®	LR 3076/70	Oil resistant, less abrasive, low comp. set, npc [4]	70	1.33	4.5	230	15	14 [5]						Platinum (1:1 A/B)	Beige	Hard-soft composite parts with oil resistant properties, e.g. seals for the automotive industry
	ELASTOSIL®	LR 3170/40	Flame retardant	44	1.12	9.0	565	24	25 [5]					V-0 (3 mm); HB (0.5; 0.8 mm)	Platinum (1:1 A/B)	Dark gray	Hard-soft composites with flame retardant properties
Oil bleeding	ELASTOSIL®	LR 3841/50	Low comp. set, npc [4]	50	1.13	9.5	490	30	13						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 1.5 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3842/40	Low comp. set, npc [4]	38	1.12	8.0	650	25	16						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 2 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3842/50	Low comp. set, npc [4]	50	1.13	9.2	460	28	12						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 2 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3842/60	Low comp. set, npc [4]	60	1.14	10.2	450	34	14						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 2 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3842/70	Low comp. set, npc [4]	68	1.15	9.0	380	30	14						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 2 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3843/30	Low comp. set, npc [4]	30	1.12	8.0	700	20	19						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 3 % oil), e.g. mat seals, single wire seals
	ELASTOSIL®	LR 3844/20	Low comp. set, npc [4]	21	1.09	6.5	800	17	17						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 4 % oil), e.g. mat seals, single wire seals
	ELASTOSIL®	LR 3844/30	Low comp. set, npc [4]	30	1.10	7.2	700	22	17						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 4 % oil), e.g. mat seals, single wire seals
	ELASTOSIL®	LR 3844/40	Low comp. set, npc [4]	42	1.14	9.0	600	24	15						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 4 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3844/50	Low comp. set, npc [4]	50	1.13	9.0	500	30	13						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 4 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3846/20	Low comp. set, npc [4]	21	1.09	6.1	800	16	14						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 6 % oil), e.g. mat seals, single wire seals
	ELASTOSIL®	LR 3846/30	Low comp. set, npc [4]	29	1.11	7.0	750	19	17						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 6 % oil), e.g. mat seals, single wire seals
	ELASTOSIL®	LR 3851/50	low comp. set, npc [4], very good cut resistance	48	1.13	9.5	530	36	15						Platinum (1:1 A/B)	Opaque	Oil bleeding molded parts (around 1.8 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3852/50	low comp. set, npc [4], very good cut resistance	47	1.13	9.2	560	36	15						Platinum (1:1 A/B)	Opaque	Oil bleeding molded parts (around 2.5 % oil), e.g. connector seals, single wire seals
	ELASTOSIL®	LR 3856/20	Low comp. set, npc [4], excellent cut resistance	22	1.08	6.2	850	16	18						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 6 % oil), e. g. mat seals with excellent cut resistance, connector seals
	ELASTOSIL®	LR 3856/30	Low comp. set, npc [4], excellent cut resistance	32	1.09	6.5	650	22	15						Platinum (1:1 A/B)	Opaque	Oil-exuding molded parts (around 6 % oil), e. g. mat seals with excellent cut resistance, connector seals
Electrically conductive	ELASTOSIL®	LR 3162	Low volume resistivity	53	1.12	5.5	400	18							Platinum (1:1 A/B)	Black	Electrically conductive molded parts
High transparency	ELASTOSIL®	LR 7661		53	1.03	8.2	130	6		X	X				Platinum (9:1 A/B)	Transparent	Molded parts with excellent transparency
	ELASTOSIL®	LR 7665		54	1.01	7.5	180	8		X	X			HB (1.5 mm)	Platinum (1:1 A/B)	Transparent	Molded parts with excellent transparency
Flame retardant	ELASTOSIL®	LR 3001/55 FR	Low inflammability, high oil resistance	53	1.37	6.0	290	18	13					V-0 (0.75 and 3 mm)	Platinum (1:1 A/B)	Dark gray/black	Flame retardant molded parts, e.g. anode caps
	ELASTOSIL®	LR 3001/60 FR	Low inflammability	61	1.37	6.5	265	18	13					V-0 (4.0 mm)	Platin (1:1 A/B)	White	Flame retardant molded parts, e.g. anode caps
	ELASTOSIL®	LR 3011/50 FR	Low inflammability, short curing times	50	1.14	8.9	470	28	17					V-0 (0.75 and 3 mm)	Platinum (1:1 A/B)	Dark gray/black	Lamp holder, seals in electronic equipment, low inflammability components

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A tighter specification regarding sh-A hardness can be possible for selected products on demand (+/-1, +/-2, +/-3).

[1] BfR recommendation XV (silicones); (BfR = Bundesinstitut für Risikobewertung).
[2] FDA CFR 21 § 177.2600 "Rubber articles intended for repeated use" (FDA = Food and Drug Administration).
[3] Categories on request.
[4] Non-post-cured.
[5] Compression set [%] (22h/125 °C) DIN ISO 815-B. Non-post-cured.
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67090 e/09.13 replaces 67090 e/11.12

PRODUCT OVERVIEW

ADDITION CURING SOLID SILICONE RUBBER

Multi-purpose · High tear resistance · Low compression set · High elasticity · Low coefficient of friction · Self-adhesion · High heat resistance · Oil bleeding · Electrically conductive

Main characteristics	Brand	Product	Hardness Shore A DIN 53505	Specific gravity [g/cm³] DIN 1183-1A	Tensile strength [N/mm²] DIN 53 504-S1	Elongation at break [%] DIN 53 504-S1	Tear resistance [N/mm] ASTM D 624 B	Compression set [%] (22 h/175 °C) DIN ISO 815-B	Food contact - BfR [1]	Food contact - FDA [2]	Molding	Extrusion	Cure system	Appearance	Typical applications
Multi-purpose	ELASTOSIL®	R *plus* 4001/30	30	1.10	10.0	1030	45	26	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts, e.g. seals, membranes, baking molds
	ELASTOSIL®	R *plus* 4001/40	40	1.12	11.5	840	38	22	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts, e.g. seals, membranes, baking molds
	ELASTOSIL®	R *plus* 4001/50	50	1.13	11.5	750	35	20	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts, e.g. seals, membranes, baking molds
	ELASTOSIL®	R *plus* 4001/60	60	1.14	11.0	608	30	16	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts, e.g. seals, membranes, baking molds or spark plug boots
	ELASTOSIL®	R *plus* 4001/70	70	1.17	10.3	609	34	27	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts, e.g. seals, membranes, baking molds or spark plug boots
	ELASTOSIL®	R *plus* 4001/80	80	1.20	8.5	580	29	32	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts, e.g. seals, membranes, baking molds
	ELASTOSIL®	R *plus* 4110/60	60	1.15	10.5	790	40	11	X	X		X	Platinum (1 component, ready to use)	Transparent	Extruded parts, e.g. tubes or profiles
	ELASTOSIL®	R *plus* 4110/70	70	1.18	10.0	720	32	13	X	X		X	Platinum (1 component, ready to use)	Transparent	Extruded parts, e.g. tubes or profiles
High tear resistance	ELASTOSIL®	R *plus* 4000/40	40	1.12	8.8	1000	46	35	X	X	X		Platinum (100:1.5 base + catalyst)	Transparent	Molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	R *plus* 4000/50	50	1.13	9.3	900	47	43	X	X	X		Platinum (100:1.5 base + catalyst)	Transparent	Molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	R *plus* 4000/60	60	1.16	9.5	750	48	23	X	X	X		Platinum (100:1.5 base + catalyst)	Transparent	Molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	R *plus* 4000/70	70	1.16	9.3	630	54	19	X	X	X		Platinum (100:1.5 base + catalyst)	Transparent	Molded parts, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	R *plus* 4020/40	39	1.14	10.9	1007	51	38	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts under high mechanical stress, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	R *plus* 4020/50	49	1.16	10.1	873	51	35	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts under high mechanical stress, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	R *plus* 4020/60	59	1.18	8.4	813	53	42	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts under high mechanical stress, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	R *plus* 4020/70	71	1.20	8.0	622	55	47	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts under high mechanical stress, e.g. baby-bottle nipples or pacifiers
	ELASTOSIL®	R *plus* 4305/30	30	1.11	8.9	800	31	20	X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. tubes or profiles
	ELASTOSIL®	R *plus* 4305/40	40	1,12	9.8	850	30	18	X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. tubes or profiles
	ELASTOSIL®	R *plus* 4305/50	50	1,14	9.2	800	38	15	X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. tubes or profiles
	ELASTOSIL®	R *plus* 4305/60 S	57	1,17	9.9	650	40		X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. tubes or profiles
	ELASTOSIL®	R *plus* 4305/70	70	1.18	10.0	640	39	10	X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. tubes or profiles
	ELASTOSIL®	R *plus* 4305/80	80	1.19	7.8	360	21	10	X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. tubes or profiles
	ELASTOSIL®	R *plus* 4305/90	90	1.20	6.4	150	17	10	X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. tubes or profiles
Low compression set	ELASTOSIL®	R *plus* 4060/50	50	1.15	8.0	500	25	9	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts, e.g. spark plug boots
	ELASTOSIL®	R *plus* 4060/60	60	1.15	8.5	380	20	8	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts, e.g. spark plug boots
High elasticity	ELASTOSIL®	R *plus* 4360/60	60	1.15	9.0	540	18	13	X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. profiles with low compression set
Low coefficient of friction	ELASTOSIL®	R *plus* 4066/60	60	1.15	9.0	770	35	27	X	X	X		Platinum (1 component, ready to use)	Transparent	Molded parts with low coefficient of friction, e.g. seals
	ELASTOSIL®	R *plus* 4366/60	60	1.15	7.0	480	34	18	X	X		X	Platinum (100:1.5 base + catalyst)	Transparent	Extruded parts, e.g. profiles with low coefficient of friction, special tubes or flat seals
Self-adhesion	ELASTOSIL®	R *plus* 4070/30	31	1.11	10.8	1096	47	30 [3]			X		Platinum (1 component, ready to use)	Translucent	Hard-soft composite molded parts, primerless adhesion to various plastic substrates (e.g. PA, PBT) and metals
	ELASTOSIL®	R *plus* 4070/60	62	1.17	10.0	650	43	75 [3]			X		Platinum (1 component, ready to use)	Translucent	Hard-soft composite molded parts, primerless adhesion to various plastic substrates (e.g. PA, PBT) and metals
	ELASTOSIL®	R *plus* 4370/40	40	1.14	9.4	890	34	50 [3]				X	Platinum (100:1.5 base + catalyst)	Translucent	Extruded or coextruded parts
	ELASTOSIL®	R *plus* 4370/50	48	1.14	19.9	900	42					X	Platinum (100:1.5 base + catalyst)	Translucent	Extruded or coextruded parts
High heat resistance	ELASTOSIL®	R *plus* 4450/60	60	1.13	8.5	430	30	15			X		Platinum (1 component, ready to use)	Black	Molded parts, e.g. seals for high temperature applications
Oil bleeding	ELASTOSIL®	R *plus* 4806/20	20	1.05	6.0	950	17	17			X		Platinum (1 component, ready to use)	Opaque	Oil-exuding molded parts, e.g. mat seals, weather packs for the automotive industry
	ELASTOSIL®	R *plus* 4846/30	30	1.11	10.0	1000	32	19			X		Platinum (1 component, ready to use)	Opaque	Oil-exuding molded parts, e.g. mat seals, weather packs for the automotive industry
Electrically conductive	ELASTOSIL®	R *plus* 573/50	51	1.11	5.5	340	15	34				X	Platinum (A/B component)	Black	Production of electrically conductive cable components and profiles (volume resistivity 6.7 Ω cm)
	ELASTOSIL®	R *plus* 573/70	70	1.16	6.3	246	17	38				X	Platinum (A/B component)	Black	Production of electrically conductive cable components and profiles (volume resistivity 1.5 Ω cm)

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

[1] BfR recommendation XV (silicones); (BfR = Bundesinstitut für Risikobewertung).
[2] FDA CFR 21 § 177.2600 "Rubber articles intended for repeated use" (FDA = Food and Drug Administration).
[3] Not post-cured, other values in this column after 4h/200 °C post-curing.
Please contact us for in-depth technical consulting to select the right product for your individual demands.
Please contact us if you are interested in products with specific characteristics or if you need products from our basic portfolio in other hardnesses.

Valves

Cooling cap for chemotherapy

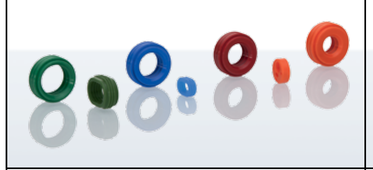
Breathing tube

Ventilation mask

Handles for surgical instruments

Ventilation bag

Seals



Catheter

Valve

Syringe seals

Wacker Chemie AG
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6709H e/03.14 replaces 6709H e/09.13

PRODUCT OVERVIEW

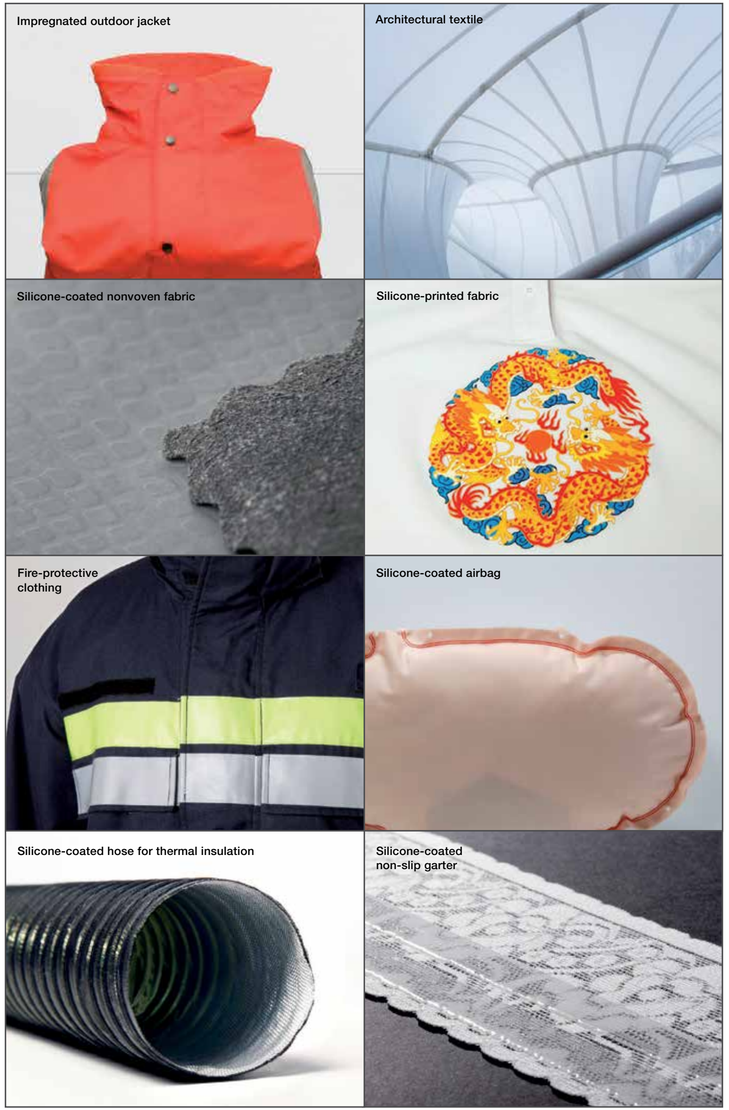
SILICONE RUBBER FOR MEDICAL APPLICATIONS

Liquid Silicone Rubber · Multi-purpose · High tear resistance · Low coefficient of friction · Self-adhesion
Solid Silicone Rubber · Multi-purpose · High tear resistance · Low coefficient of friction

Main characteristics	Brand	Product	Product type / cure system	Hardness Shore A DIN 53505	Specific gravity [g/cm³] DIN 1183-1A	Tensile strength [N/mm²] DIN 53 504-S1	Elongation at break [%] DIN 53 504-S1	Tear resistance [N/mm] ASTM D 624 B	Compression set [%] (22 h/175 °C) DIN ISO 815-B	Food contact - BfR [1]	Food contact - FDA [2]	Medical, pharma, biotech - USP Class VI [3]	Medical pharma., biotech - ISO 10993 [4]	Molding	Extrusion	Appearance	Typical applications
Liquid silicone rubber																	
Multi purpose	SILPURAN®	6000/05	LSR, platinum (1:1 A/B)	06	1.04	2.4	680	7.8	11	X		X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6000/10	LSR, platinum (1:1 A/B)	12	1.07	4.2	720	16	13	X		X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6000/20	LSR, platinum (1:1 A/B)	20	1.08	6.5	760	28	17	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6000/30	LSR, platinum (1:1 A/B)	32	1.10	8.5	670	33	13	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6000/40	LSR, platinum (1:1 A/B)	41	1.12	9.3	590	35	13	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6000/50	LSR, platinum (1:1 A/B)	50	1.13	10.2	490	32	14	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6000/60	LSR, platinum (1:1 A/B)	60	1.13	10.0	370	29	14	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6000/70	LSR, platinum (1:1 A/B)	69	1.15	9.3	300	23	11	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
High tear resistance	SILPURAN®	6400/40	LSR, platinum (1:1 A/B)	40	1.12	9.1	630	37	20	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6400/50	LSR, platinum (1:1 A/B)	50	1.12	9.1	460	42	22	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
	SILPURAN®	6400/60	LSR, platinum (1:1 A/B)	60	1.13	9.1	380	43	19	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry
Low coefficient of friction	SILPURAN®	6600/40	LSR, platinum (1:1 A/B)	41	1.12	8.8	570	35	14	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry with a low coefficient of friction
	SILPURAN®	6600/50	LSR, platinum (1:1 A/B)	48	1.12	8.6	440	32	13	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry with a low coefficient of friction
	SILPURAN®	6600/60	LSR, platinum (1:1 A/B)	59	1.12	8.6	330	27	14	X	X	X	X	X		Transparent	Molded parts for the medical and pharma industry with a low coefficient of friction
Non-healing	SILPURAN®	6610/40	LSR, platinum (1:1 A/B)	40	1.21	6.5	460	23	8	X	X	X	X	X		White	Needle free valves, slit membranes where healing needs to be avoided
	SILPURAN®	6610/50	LSR, platinum (1:1 A/B)	50	1.23	7.4	450	27	12	X	X	X	X	X		White	Needle free valves, slit membranes where healing needs to be avoided
	SILPURAN®	6610/60	LSR, platinum (1:1 A/B)	59	1.23	6.8	280	20	11	X	X	X	X	X		White	Needle free valves, slit membranes where healing needs to be avoided
	SILPURAN®	6610/70	LSR, platinum (1:1 A/B)	70	1.24	6.9	220	19	16	X	X	X	X	X		White	Needle free valves, slit membranes where healing needs to be avoided
	SILPURAN®	6610/80	LSR, platinum (1:1 A/B)	77	1.26	6.2	140	15	14	X	X	X	X	X		White	Needle free valves, slit membranes where healing needs to be avoided
Self adhesion	SILPURAN®	6700/40	LSR, platinum (1:1 A/B)	39	1.11	8.0	620	23		X	X	X	X	X		Transparent	Hard-soft composite parts for the medical and pharma industry (silicone on PA, PBT)
	SILPURAN®	6700/50	LSR, platinum (1:1 A/B)	51	1.12	8.0	580	27		X	X	X	X	X		Transparent	Hard-soft composite parts for the medical and pharma industry (silicone on PA, PBT)
	SILPURAN®	6700/60	LSR, platinum (1:1 A/B)	60	1.12	8.2	470	27		X	X	X	X	X		Transparent	Hard-soft composite parts for the medical and pharma industry (silicone on PA, PBT)
Self adhesion, high tear	SILPURAN®	6740/40	LSR, platinum (1:1 A/B)	37	1.10	8.7	700	30	10	X	X	X	X	X		Transparent	Hard-soft composite parts for the medical and pharma industry (silicone on PA, PBT)
Solid silicone rubber																	
Multi purpose	SILPURAN®	8020/40	HTV, platinum (100:1.5 base + catalyst)	44	1.12	11.6	835	38	25	X	X	X	X	X		Translucent	Molded parts for the medical and pharma industry
	SILPURAN®	8020/50	HTV, platinum (100:1.5 base + catalyst)	51	1.14	11.8	770	40	30	X	X	X	X	X		Translucent	Molded parts for the medical and pharma industry
	SILPURAN®	8020/60	HTV, platinum (100:1.5 base + catalyst)	61	1.16	11.6	690	31	30	X	X	X	X	X		Translucent	Molded parts for the medical and pharma industry
	SILPURAN®	8020/70	HTV, platinum (100:1.5 base + catalyst)	71	1.18	10.3	650	38	35	X	X	X	X	X		Translucent	Molded parts for the medical and pharma industry
	SILPURAN®	8030/40	HTV, platinum (100:1.5 base + catalyst)	39	1.13	10.1	865	32	14	X	X	X	X		X	Translucent	Extruded parts, e.g. tubes and profiles for the medical and pharma industry
	SILPURAN®	8030/50	HTV, platinum (100:1.5 base + catalyst)	51	1.14	9.1	781	36	20	X	X	X	X		X	Translucent	Extruded parts, e.g. tubes and profiles for the medical and pharma industry
	SILPURAN®	8030/60	HTV, platinum (100:1.5 base + catalyst)	58	1.17	10.3	660	41	25	X	X	X	X		X	Translucent	Extruded parts, e.g. tubes and profiles for the medical and pharma industry
	SILPURAN®	8030/70	HTV, platinum (100:1.5 base + catalyst)	68	1.18	9.1	650	44	25	X	X	X	X		X	Translucent	Extruded parts, e.g. tubes and profiles for the medical and pharma industry
	SILPURAN®	8060/40	HTV, peroxide (base + Crosslinker E)	39	1.12	9.5	590	22	35	X	X	X	X		X	Transparent	Medical / pharmaceutical extruded or molded parts
	SILPURAN®	8060/50	HTV, peroxide (base + Crosslinker E)	51	1.14	11.0	540	25	35	X	X	X	X		X	Transparent	Medical / pharmaceutical extruded or molded parts
	SILPURAN®	8060/60	HTV, peroxide (base + Crosslinker E)	59	1.15	11.0	500	26	25	X	X	X	X		X	Transparent	Medical / pharmaceutical extruded or molded parts
	SILPURAN®	8060/70	HTV, peroxide (base + Crosslinker E)	68	1.18	11.5	480	29	35	X	X	X	X		X	Transparent	Medical / pharmaceutical extruded or molded parts
High tear resistance	SILPURAN®	8461/60	HTV, peroxide (base + Crosslinker E)	61	1.18	10.8	510	36	31	X	X	X	X		X	Transparent	Medical / pharmaceutical extruded parts with high tear resistance. e.g. tubes or profiles
Low coefficient of friction	SILPURAN®	8630/60	HTV, platinum (100:1.5 base + catalyst)	62	1.15	8.1	520	42	17	X	X	X	X		X	Translucent	Extruded parts with low coefficient of friction. e.g. tubes and profiles for the medical and pharma industry

All SILPURAN® products are produced in accordance to WACKER CLEAN OPERATIONS standards.
These figures are only intended as a guide and should not be used in preparing specifications.

[1] BfR recommendation XV (silicones); (BfR = Bundesinstitut für Risikobewertung).
[2] FDA CFR 21 § 177.2600 "Rubber articles intended for repeated use" (FDA = Food and Drug Administration).
[3] Systemic / intracut. toxicity, implantation test (additional tests on request).
[4] Cytotoxicity, sensitization as per LLNA, pyrogenicity (additional tests on request).
Please contact us about the compliance of our SILPURAN® grades with European Pharmacopoeia, Chapter 3.1.9 "Silicone elastomers for closures and tubing".
Please contact us for in-depth technical advice on selecting the right product for your individual needs.
Please contact us if you are interested in products with specific characteristics or if you need products from our basic portfolio in other hardnesses.
Device Master Files listed at FDA.



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ELASTOSIL®

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6934e/09.13 replaces 6934e/06.13

PRODUCT OVERVIEW

SILICONE RUBBER FOR TEXTILE COATING

Rubber Dispersions · High Temperature Curing Silicone Rubber · Room Temperature Curing Silicone Rubber · Top Coats

Product	Curing mechanism	Characteristics	Color	Viscosity (Brookfield) [mPas] (ISO 2555)	Viscosity at 1/sec [mPas] DIN EN ISO 3219 / 25 °C	Viscosity at 10/sec [mPas] DIN EN ISO 3219 / 25 °C	Hardness Shore A DIN 53505	Tensile strength [N/mm²] DIN 53504-S1	Elongation at break [%] DIN 53504-S1	Tear resistance [N/mm] ASTM D 624 B	Processing	BfR XV. Silicones*	FDA 175.300 coatings*
Rubber Dispersions													
ELASTOSIL® RD 6680 F	addition	Solid content: 50% in white spirits	black	24,000	18,000	4,000	35	3.5	420	10	Addition of 3% ELASTOSIL® CROSSLINKER 525 or 1% WACKER® CROSSLINKER W required	-	-
WACKER® FINISH CT 51 L	condensation	Silky and flexible coatings, solvent-based (50% xylene)	transparent	16,000	31,000	19,000	-	-	-	-	Addition of WACKER® INHIBITOR PT 88 and 1% WACKER® CATALYST C05 required	+	+
High Temperature Curing Silicone Rubber													
ELASTOSIL® LR 3001/55 FR A/B	addition	Flame retardant (UL 94: V-0)	grey	360,000	250,000	150,000	51	5.5	340	17	A/B-System, mixing ratio A:B = 1:1	-	-
ELASTOSIL® LR 3003/20 TR A/B	addition	General purpose, excellent mechanical properties	transparent	560,000	353,000	248,000	20	8.5	880	25	A/B-System, mixing ratio A:B = 1:1	+	+
ELASTOSIL® LR 3003/30 A/B	addition	General purpose, excellent mechanical properties	transparent	450,000	226,000	116,000	30	7.5	610	23	A/B-System, mixing ratio A:B = 1:1	+	+
ELASTOSIL® LR 6200 A/B	addition	Low viscosity, dry surface	white	20,000	15,000	9,000	45	4.3	190	4	A/B-System, mixing ratio A:B = 1:1	-	-
ELASTOSIL® LR 6240 A/B	addition	Good flexibility, high modulus	transparent	35,000	30,000	20,000	36	3.0	290	7	A/B-System, mixing ratio A:B = 1:1	+	+
ELASTOSIL® LR 6250 F	addition	General purpose	transparent	125,000	53,000	32,000	40	5.0	350	6	Addition of 3% ELASTOSIL® CROSSLINKER 525 or 1% WACKER® CROSSLINKER W	-	+
ELASTOSIL® LR 6251 F	addition	General purpose, fast curing	transparent	130,000	66,000	36,000	36	5.2	450	6	Addition of 3% ELASTOSIL® CROSSLINKER 525 or 1% WACKER® CROSSLINKER W	-	+
ELASTOSIL® LR 6253 F	addition	Dry surface, contains inactive filler	white	16,000	22,000	15,000	52	2.3	190	6	Addition of 3% WACKER® CROSSLINKER W and 1% WACKER® CATALYST C 05 required	-	-
ELASTOSIL® LR 6260 A/B	addition	High dielectric strength	ivory	130,000	57,000	31,000	44	5.7	430	7	A/B-System, mixing ratio A:B = 1:1	-	+
ELASTOSIL® NT 76	addition	Newtonian rheology	transparent	35,000	33,000	33,000	20	0.7	160	2	Addition of 3% ELASTOSIL® CROSSLINKER 525 required	+	+
ELASTOSIL® R 401/40	peroxide	General purpose	transparent	n. a.	n. a.	n. a.	40	10.0	580	28	Addition of 1.5% ELASTOSIL® AUX CURING AGENT E or 0.7% ELASTOSIL® AUX CURING AGENT C1 required	+**	+**
ELASTOSIL® R *plus* 4001/40	addition	General purpose	transparent	n. a.	n. a.	n. a.	40	11.0	940	38	Ready to use system	+	+
Room Temperature Curing Silicone Rubber													
ELASTOSIL® E43 N	condensation	General purpose, excellent adhesion	transparent	360,000	380,000	260,000	35	4.5	350	12	Ready to use system	+	+
ELASTOSIL® E50	condensation	General purpose, self leveling	transparent	54,000	58,000	51,000	35	3.6	350	3	Ready to use system	-	-
ELASTOSIL® E91	condensation	Anti-slip surface, fast curing with steam	transparent	120,000	100,000	60,000	20	1.2	350	-	Ready to use system	-	-
ELASTOSIL® E92 N	condensation	Anti-slip surface, fast skin formation at room temperature	transparent	120,000	100,000	60,000	20	1.2	350	-	Ready to use system	-	-
Top Coats													
ELASTOSIL® 47007	addition	Low coefficient of friction, solvent-free	ivory	22,000	16,000	7,000	-	-	-	-	Addition of 3% ELASTOSIL® CROSSLINKER W or 5% WACKER® CROSSLINKER HX required	-	-
ELASTOSIL® RD 3151 F	addition	Glossy varnish, easy to clean, solvent-based (50% white spirits)	transparent	5,000	20,000	3,500	-	-	-	-	Addition of 3% WACKER® CROSSLINKER W required	-	-
ELASTOSIL® RD 6620 F	addition	Matt varnish, solvent-based (50% xylene)	colorless opaque	670,000	330,000	75,000	-	-	-	-	Addition of 1% WACKER® CROSSLINKER W required	-	-

* Valid for the silicone base. Additives have to be evaluated separately!
** Valid after post-curing (4h/200 °C)

ROMI®

SANDRETTO

Máquinas
Inyectoras de Plástico

Industrias Romi - tradicional fabricante brasileño de máquinas herramienta, maquinaria para el proceso del plástico y fundición, y Sandretto, reconocido fabricante italiano de máquinas para la inyección del plástico han unido sus fuerzas para consolidar su posición en el mercado global. La combinación de co-working y know-how ha logrado resultados

ROMI® +

WORKING TOGETHER;

1. Romi districto industrial en Santa Bárbara d'Oeste, São Paulo, Brasil
2. Línea de producción
3. Fundición
4. Detalles de la producción de piezas
5. Pesquisa y desarollo de nuevos productos

Romi

Fundada en 1930, Romi es líder en el mercado brasileño de maquinaria y equipamiento industrial. La compañía fabrica principalmente máquinas herramienta, tornos y centros de mecanizado, maquinaria para el proceso de inyección del plástico y para el moldeo por soplado de termoplásticos y piezas de fundición.

Con presencia mundial desde 1944, Romi posee filiales en EE.UU., México, Alemania, Inglaterra, España y Francia, y fábricas en Brasil e Italia.

Con la adquisición de los activos de Sandretto en 2008, Romi ha reforzado su presencia a nivel mundial.

importantes en tecnología, innovación y servicios, beneficiando directamente a sus clientes en todo el mundo. Romi y Sandretto, juntas: más de 180.000 máquinas vendidas en el mundo. Confianza y fuerza para sus clientes.

SANDRETTO

GETTING RESULTS


6


7


8

13


9


10


11

12

Sandretto

Fundada en 1946, Sandretto es líder tradicional en el diseño, fabricación y venta de máquinas para la inyección del plástico y uno de los principales fabricantes de la industria a nivel mundial.

Su línea de productos incluye máquinas inyectoras que van desde 75 a 5500 toneladas de fuerza de cierre. Desde el 24 de julio de 2008, los activos de Sandretto Industrie s.r.l son parte de Industrias Romi, S.A..

Esta adquisición es parte de la estrategia de internalización Romi y permitirá la expansión del negocio de la compañía en el sector de la maquinaria para el proceso del plástico, tanto en el mercado de Brasil como en los mercados internacionales.

6. Sandretto - Grugliasco - Italia
7. Sandretto - Grugliasco - Italia
8. Línea de producción - Sandretto Grugliasco - Italia
9. Sandretto - Francia
10. Sandretto - España
11. Sandretto - Pont Canavese - Italia
12. Sandretto - Reino Unido
13. AGV

Nuevo Producto

La Romi Sandretto Serie P está equipada con bomba de caudal variable, lo que ofrece un excelente rendimiento, gran ahorro de energía y baja emisión de ruidos.

La Romi Sandreto P es compacta, fácil de operar y de mantenimiento sencillo. Esta línea de máquinas combina tecnología y productividad con una relación coste-beneficio muy beneficiosa para sus clientes.

La Romi Sandretto P posee unidad de cierre bi-toogle, adecuada para tonelajes pequeños y medios, ideal para aparatos electrodomésticos, artículos para el hogar y productos electrónicos.

El avanzado diseño del nuevo sistema hidráulico, con la nueva unidad de control "CM 10" con pantalla táctil interfaz de 10,4", asegura un alto rendimiento, y capacidad de repetición de conectividad sencilla, y situa a la Romi Sandretto P en lo más alto de su categoría.

Romi Sandretto Serie P
De 80 a 450 tons

		P 80				P 130				P 170				P 220			
Control panel		CM10				CM10				CM10				CM10			
Fuerza de cierre del molde	kN	800				1.300				1.700				2.200			
Carrera máxima de apertura	mm	360				420				460				560			
Altura del molde (max - min)	mm	360 x 130				460 x 160				500 x 160				630 x 200			
Espacio entre columnas	mm	360 x 360				420 x 420				470 x 470				560 x 560			
Clasificación EUROMAP		370				650				800				1.000			
Diámetro del tornillo	mm	30	35	40	45	40	45	50	55	45	50	55	60	45	50	55	60
Razón del tornillo	L/D	25	22	20	18	25	22	20	18	24	22	20	18	24	22	20	18
Volumen máximo de inyección	cm^3	127	173	226	286	258	326	402	487	350	432	522	622	430	530	642	765
Presión máxima de inyección	bar	2.900	2.130	1.630	1.300	2.550	2.015	1.630	1.350	2.350	1.900	1.570	1.320	2.350	1.900	1.570	1.300
Razón de inyección	cm^3/s	80	110	145	185	140	180	220	270	160	197	240	285	200	250	300	360
Capacidad de plastificación (PS)	g/s	10	15	22	30	17	24	33	44	23	32	42	53	22	30	40	50

		P 300				P 380				P 450			
Control panel		CM10				CM10				CM10			
Fuerza de cierre del molde	kN	3.000				3.800				4.500			
Carrera máxima de apertura	mm	650				750				880			
Altura del molde (max - min)	mm	750 x 200				750 x 200				880 x 250			
Espacio entre columnas	mm	650 x 650				700 x 700				800 x 800			
Clasificación EUROMAP		1.950				2.220				3.100			
Diámetro del tornillo	mm	55	60	65	70	60	65	70	80	65	70	75	80
Razón del tornillo	L/D	24	22	20	19	23	22	20	18	23	22	20	18
Volumen máximo de inyección	cm^3	772	919	1.078	1.251	1.018	1.195	1.385	1.810	1.330	1.540	1.770	2.010
Presión máxima de inyección	bar	2.350	2.130	1.810	1.560	2.200	1.900	1.600	1.300	2.350	2.020	1.760	1.550
Razón de inyección	cm^3/s	240	285	335	385	325	380	442	578	350	405	465	530
Capacidad de plastificación (PS)	g/s	40	50	65	80	42	53	66	98	60	75	92	112

Más detalles técnicos: www.romi.com

Especificaciones de acuerdo a normas EUROMAP.

Nuevo Producto

La serie Romi Sandretto EN está diseñada con tecnología de última generación y equipada con bombas accionadas por inverter controlado por motor, para proporcionar ahorro de energía con un excelente rendimiento, ofreciendo ahorro de energía de hasta un 40% y una baja emisión de ruidos. El ahorro puede alcanzar el 40% y la reducción de hasta un 60% se ha demostrado en pruebas reales de los clientes.

Esta línea de máquinas combina la alta tecnología y productividad con un costo-beneficio muy bueno para los clientes. La Romi Sandretto EN viene a satisfacer las necesidades de las empresas que están buscando una máquina de alta eficiencia, de nivel compacto, de poco ruido, fácil de operar y de mantenimiento simple.

La serie Sandretto EN posee unidad de cierre toogle, adecuado para tonelaje medio-pequeño, ideal para los aparatos electrodomésticos, artículos para el hogar y productos electrónicos.

El avanzado diseño del nuevo sistema hidráulico, con el apoyo de la nueva unidad de control "CM 10" con 10,4" interfaz de pantalla táctil, asegura elevadas prestaciones, repetitividad y conectividad, y cuenta con componentes de alto rendimiento, lo que coloca a la serie Romi Sandretto EM en lo más alto de su categoría.

Romi Sandretto Serie EN
De 70 a 450 tons

		EN 70				EN 100				EN 150				EN 200			
Control panel		CM10				CM10				CM10				CM10			
Fuerza de cierre del molde	kN	700				1.000				1.500				2.000			
Carrera máxima de apertura	mm	360				420				460				560			
Altura del molde (max - min)	mm	360 x 130				460 x 160				500 x 160				630 x 200			
Espacio entre columnas	mm	360 x 360				420 x 420				470 x 470				560 x 560			
Clasificación EUROMAP		370				370				650				800			
Diámetro del tornillo	mm	30	35	40	45	30	35	40	45	40	45	50	55	45	50	55	60
Razón del tornillo	L/D	25	22	20	18	25	22	20	18	25	22	20	18	24	22	20	18
Volumen máximo de inyección	cm^3	127	173	226	286	127	173	226	286	258	326	402	487	350	432	522	622
Presión máxima de inyección	bar	2.670	1.960	1.500	1.200	2.670	1.960	1.500	1.200	2.350	1.950	1.500	1.200	2.160	1.750	1.450	1.215
IRazón de inyección	cm^3/s	85	115	152	192	140	190	250	315	160	200	250	300	250	310	375	450
Capacidad de plastificación (PS)	g/s	8	13	19	26	14	21	30	43	16	24	32	43	30	40	55	70

		EN 260				EN 340				EN 450			
Control panel		CM10				CM10				CM10			
Fuerza de cierre del molde	kN	2.600				3.400				4.500			
Carrera máxima de apertura	mm	650				750				880			
Altura del molde (max - min)	mm	750 x 200				750 x 200				880 x 250			
Espacio entre columnas	mm	650 x 650				700 x 700				800 x 800			
Clasificación EUROMAP		1.000				1.950				2.200			
Diámetro del tornillo	mm	45	50	55	60	55	60	65	70	60	65	70	80
Razón del tornillo	L/D	24	22	20	18	24	22	20	19	23	22	20	18
Volumen máximo de inyección	cm^3	430	530	642	765	772	919	1.078	1.251	1.018	1.195	1.385	1.810
Presión máxima de inyección	bar	2.160	1.750	1.450	1.215	2.400	2.000	1.720	1.480	2.020	1.720	1.500	1.150
Razón de inyección	cm^3/s	250	310	375	450	390	465	550	640	450	530	610	800
Capacidad de plastificación (PS)	g/s	23	32	43	55	44	57	72	90	55	70	88	130

Más detalles técnicos: www.romi.com

Especificaciones de acuerdo a normas EUROMAP.

Nuevo Producto

La Sandretto EL, serie de máquinas de alto rendimiento, totalmente eléctrica, cambia radicalmente los conceptos de moldeo por inyección. De accionamiento totalmente eléctrico, la máquina es ecológica, fiable, rápida y precisa.

Con la más alta tecnología y el uso de servomotores, el equipo proporciona un ahorro energético de hasta un 60% y, según el modelo de la máquina, el ahorro puede llegar al 80%. Su emisión de ruido es baja, cerca de 60 decibeles y entrega a la generación de calefacción un 80% menos en su entorno.

Repetibilidad y precisión superior, la Romi Sandretto EL garantiza la certeza centesimal de todos los movimientos a través de servomotores con sistema codificador óptico y el uso de guías lineales. Esta serie tiene control de movimiento simultáneo y ofrece un fácil manejo de componentes móviles y la tecnología asociada ofrece una mejor productividad y logra ciclos hasta un 25% más cortos y menos variación del peso de las piezas inyectadas.

A través de este sistema, el área del molde está libre de contaminación por petróleo, por lo que es adecuada para Sala-Limpia. Este nuevo concepto de manejo es revolucionario en su categoría.

Romi Sandretto Serie EL
De 75 a 300 tons

		EL 100				EL 150				EL 220				EL 300			
Control panel		e-ONE				e-ONE				e-ONE				CM15			
Fuerza de cierre del molde	kN	1.000				1.500				2.200				3.000			
Carrera máxima de apertura	mm	410				460				560				650			
Altura del molde (max - min)	mm	460 x 150				520 x 160				630 x 200				730 x 200			
Espacio entre columnas	mm	410 x 410				460 x 460				560 x 560				730 x 730			
Clasificación EUROMAP		366				485				873				1.330			
Diámetro del tornillo	mm	30	35	40	45	35	40	45	50	45	50	55	60	50	55	60	65
Razón del tornillo	L/D	26	22	20	17	25	22	20	18	25	22	20	18	24	22	20	18,5
Volumen máximo de inyección	cm^3	113	153	201	254	173	226	286	353	350	432	522	622	550	665	791	929
Presión máxima de inyección	bar	2.000	2.000	1.821	1.439	2.000	2.000	1.694	1.372	2.000	2.000	1.672	1.405	2.420	2.000	1.680	1.430
Razón de inyección	cm^3/s	100	133	175	220	175	228	289	357	175	217	262	312	423	511	608	715
Capacidad de plastificación (PS)	g/s	10	15	22	32	16	23	33	45	24	33	44	57	35	42	50	59

Más detalles técnicos: www.romi.com

Especificaciones de acuerdo a normas EUROMAP.

Productos Sandretto

Sandretto HPF Serie
De 150 a 450 tons

La Sandretto HPF (Fast) ha llegado para satisfacer las demandas del sector del embalaje con tiempos de ciclo rápido para producir piezas de pared delgada.

Basándose en tres bombas y dos circuitos de control, además de los acumuladores de presión en la unidad de inyección, las Sandretto HP ofrecen todas las soluciones con movimientos completos de superposición.

		HPF 1500			HPF 2000						HPF 2700					
Control panel		e-ONE			e-ONE						e-ONE					
Fuerza de cierre del molde	kN	1.500			2.000						2.700					
Carrera máxima de apertura	mm	550			630						710					
Altura del molde (max - min)	mm	630 x 210			730 x 210						730 x 200					
Espacio entre columnas	mm	510 x 510			570 x 570						650 x 650					
Clasificación EUROMAP		860			860			1.180			1.180			1.630		
Diámetro del tornillo	mm	43	50	55	43	50	55	50	55	63	50	55	63	55	63	70
Razón del tornillo	L/D	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Volumen máximo de inyección	cm^3	319	432	522	319	432	522	495	598	785	495	598	785	665	872	1.077
Presión máxima de inyección	bar	2.700	1.997	1.650	2.700	1.997	1.650	2.389	1.974	1.505	2.389	1.974	1.505	2.451	1.868	1.513
Razón de inyección	cm^3/s	1.452	1.963	2.375	1.452	1.963	2.375	2.041	2.469	3.240	2.041	2.469	3.240	2.375	3.116	3.847
Capacidad de plastificación (PS)	g/s	41,1	52,5	61,2	41,1	52,5	61,2	52,5	61,2	76,2	52,5	61,2	76,2	61,1	76,2	90,4

		HPF 3600						HPF 4500		
Control panel		e-ONE						e-ONE		
Fuerza de cierre del molde	kN	3.600						4.500		
Carrera máxima de apertura	mm	830						900		
Altura del molde (max - min)	mm	850 x 250						1.000 x 300		
Espacio entre columnas	mm	740 x 740						900 x 900		
Clasificación EUROMAP		1.630			2.480			3.800		
Diámetro del tornillo	mm	55	63	70	63	70	80	70	80	93
Razón del tornillo	L/D	24	24	24	24	24	24	24	24	24
Volumen máximo de inyección	cm^3	665	872	1.077	997	1.231	1.608	1.431	1.869	2.526
Presión máxima de inyección	bar	2.451	1.868	1.513	2.487	2.015	1.542	2.654	2.032	1.504
Razón de inyección	cm^3/s	2.387	3.131	3.866	3.116	3.847	5.025	3.014	3.937	5.320
Capacidad de plastificación (PS)	g/s	61,1	76,2	90,4	76,2	90,4	112,2	90,4	112,2	143,1

Sandretto PET Serie
De 150 a 450 tons

La serie Sandretto PET fue diseñada para cubrir las necesidades del sector del embalaje para alta velocidad.

La Sandretto PET posee servo-acumuladores hidráulicos, más unidades de motor de bomba, válvulas de alta capacidad y sistema hidráulico.

		PET 1500	PET 2000	PET 2700	PET 3600
Control panel		e-ONE	e-ONE	e-ONE	e-ONE
Fuerza de cierre del molde	kN	1.500	2.000	2.700	3.600
Carrera máxima de apertura	mm	550	630	710	830
Altura del molde (max - min)	mm	630 x 210	730 x 210	730 x 200	850 x 250
Espacio entre columnas	mm	510 x 510	570 x 570	650 x 650	740 x 740
Clasificación EUROMAP		860	1.180	1.630	2.480
Diámetro del tornillo	mm	55	63	70	80
Razón del tornillo	L/D	24	24	24	24
Volumen máximo de inyección	cm^3	522	785	1.077	1.608
Presión máxima de inyección	bar	1.650	1.505	1.513	1.542
Razón de inyección	cm^3/s	2.375	3.240	3.847	5.025
Capacidad de plastificación (PS)	g/s	61,2	76,2	90,4	112,2

Sandretto TEF Serie
De 610 a 1100 tons

Las máquinas de la serie Sandretto TEF, están equipadas con husillo de motor eléctrico, y circuito de acumuladores de potencia de serie para todas las funciones hidráulicas, por lo que representa la solución perfecta para clientes con necesidad de alta producción y ciclos de tiempo cortos. Cuenta con un motor eléctrico para la plastificación, que permite una superposición completa de todos los movimientos.

		TEF 6100		TEF 8200		TEF 11000
Control panel		e-ONE		e-ONE		e-ONE
Fuerza de cierre del molde	kN	6.100		8.200		1.1000
Carrera máxima de apertura	mm	930		1.150		1.350
Altura del molde (max - min)	mm	1.000 x 300		1.100 x 350		1.350 x 450
Espacio entre columnas	mm	950 x 850		1250 x 1.060		1.420 x 1.230
Clasificación EUROMAP		4.435	6.434	6.434	9.130	9.130
Diámetro del tornillo	mm	90	105	105	120	120
Razón del tornillo	L/D	25	25	25	25	25
Volumen máximo de inyección	cm^3	2.863	4.330	4.330	6.107	6.107
Presión máxima de inyección	bar	1.549	1.505	1.505	1.503	1.503
Razón de inyección	cm^3/s	2.863	2.857	2.857	2.827	2.827
Capacidad de plastificación (PS)	g/s	127	160	160	199	199

Productos Sandretto

Sandretto HP Serie
De 75 a 485 tons

La serie Sandretto HP ha sido diseñada para satisfacer las necesidades del sector de la maquinaria del plástico para uso general.

Esta es una serie de proceso revolucionario: basado en una doble bomba y dos circuitos

		HP 750/900			HP 1000/1200						HP 1300/1650					
Control panel		e-ONE			e-ONE						e-ONE					
Fuerza de cierre del molde	kN	750 / 900			1.000 / 1.200						1.300 / 1.650					
Carrera máxima de apertura	mm	410			410						500					
Altura del molde (max - min)	mm	460 x 100			460 x 100						560 x 155					
Espacio entre columnas	mm	370 x 370			415 x 415						460 x 460					
Clasificación EUROMAP		285			285			430			430			650		
Diámetro del tornillo	mm	30	33	38	30	33	38	33	38	43	33	38	43	38	43	50
Razón del tornillo	L/D	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Volumen máximo de inyección	cm^3	118	143	189	118	143	189	162	214	274	162	214	274	249	319	432
Presión máxima de inyección	bar	2.427	2.006	1.512	2.427	2.006	1.512	2.659	2.005	1.566	2.659	2.005	1.566	2.599	2.029	1.501
Razón de inyección	cm^3/s	143,7	173,9	230,6	143,7	173,9	230,6	146	193	247	146	193	247	218	279	377
Capacidad de plastificación (PS)	g/s	18,4	22,3	28,1	18,4	22,3	28,1	18,9	27,3	34,3	18,9	27,3	34,3	21,3	29,5	43,7

Sandretto TES Serie
De 550 a 1500 tons

La máquina de la serie Sandretto TES se ha proyectado para atraer clientes com necesidad de alta precisión para materiales de ingeniería.

La máquina está diseñada para ser altamente confiable y rápida, con alta capacidad de plastificación. Con un nuevo concepto hidráulico

		TES 5500						TES 7000										
Control panel		e-ONE						e-ONE										
Fuerza de cierre del molde	kN	5.500						7.000										
Carrera máxima de apertura	mm	930						1.150										
Altura del molde (max - min)	mm	1.000 x 300						1.100 x 350										
Espacio entre columnas	mm	950 x 850						1.060 x 1.060										
Clasificación EUROMAP		4.170			6.000			4.170			6.000			9.130			6.000	
Diámetro del tornillo	mm	70	80	93	80	93	105	70	80	93	80	93	105	93	105	120	80	93
Razón del tornillo	L/D	20	20	20	20	20	20	20	20	20	20	20	20	20	20	2.020	20	20
Volumen máximo de inyección	cm^3	1.574	2.056	2.778	2.322	3.138	4.000	1.574	2.056	2.778	2.322	3.138	4.000	3.668	4.676	6.107	2.322	3.138
Presión máxima de inyección	bar	2.647	2.027	1.500	2.584	1.912	1.500	2.647	2.027	1.500	2.584	1.912	1.500	2.497	1.959	1.500	2.584	1.912
Razón de inyección	cm^3/s	366	479	647	486	656	837	366	479	647	486	656	837	653	832	1.087	486	656
Capacidad de plastificación (PS)	g/s	60	84	120	73	108	146	60	84	120	73	108	146	89	122	172	3	108

Sandretto HES Serie
De 1300 a 5000 tons

La serie Sandretto HES máquina con unidad de cierre de dos placas hidro-block, permite una relación favorable entre el máximo espacio entre placas y la longitud total de la máquina. Un nuevo

concepto que ajusta la entrega de combustible a la demanda. El sistema hidráulico se basa en un sistema multi-etapa de las bombas con precisión que regula el suministro de el control de la

		HES 13000/15000								
Control panel		e-ONE								
Fuerza de cierre del molde	kN	13.000 / 15.000								
Carrera máxima de apertura	mm	1,600								
Altura del molde (max - min)	mm	1.400 x 650								
Espacio entre columnas	mm	1.500 x 1.400								
Clasificación EUROMAP		9.130			11.595			17.750		
Diámetro del tornillo	mm	93	105	120	105	120	135	120	135	155
Razón del tornillo	L/D	20	20	20	20	20	20	20	20	20
Volumen máximo de inyección	cm^3	3.668	4.676	6.107	4.676	6.107	7.729	7.069	8.946	11.793
Presión máxima de inyección	bar	2.497	1.959	1.500	2.480	1.899	1.500	2.535	2.003	1.519
Razón de inyección	cm^3/s	653	832	1.087	822	1.074	1.359	1.026	1.299	1.712
Capacidad de plastificación (PS)	g/s	89	122	172	113	159	211	146	193	254

		HES 23000/25000								
Control panel		e-ONE								
Fuerza de cierre del molde	kN	23.000 / 25.000								
Carrera máxima de apertura	mm	2.200								
Altura del molde (max - min)	mm	2.000 x 800								
Espacio entre columnas	mm	2.000 x 1.700								
Clasificación EUROMAP		25.255			31.800			60.400		
Diámetro del tornillo	mm	135	155	175	135	155	175	155	175	200
Razón del tornillo	L/D	20	20	20	20	20	20	20	20	20
Volumen máximo de inyección	cm^3	10.020	13.208	16.837	12.510	16.500	21.030	21.700	27.661	36.128
Presión máxima de inyección	bar	2.542	1.928	1.513	2.542	1.928	1.513	2.786	2.185	1.673
Razón de inyección	cm^3/s	1.279	1.686	2.149	1.279	1.686	2.149	1.751	2.232	2.915
Capacidad de plastificación (PS)	g/s	176	242	297	176	242	297	218	288	350

de control, las Sandretto HP ofrecen todas las soluciones con movimientos completos de superposición.

HP 1700/2200						HP 2300/3000						HP 3200/3950						HP 4000/4850					
e-ONE						e-ONE						e-ONE						e-ONE					
1.700 / 2.200						2.300 / 3.000						3.200 / 3.950						4.000/4.850					
550						630						710						830					
630 x 210						730 x 210						730 x 200						850 x 250					
460 x 460						510 x 510						650 x 650						740 x 740					
650			860			860			1.300			1.300			1.780			1.780			2.650		
38	43	50	43	50	55	43	50	55	50	55	63	50	55	63	55	63	70	55	63	70	63	70	80
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
249	319	432	351	475	575	351	475	575	544	658	863	544	658	863	731	960	1.185	731	960	1.185	1.097	1.354	1.768
2.599	2.029	1.501	2.454	1.815	1.500	2.454	1.815	1.500	2.402	1.985	1.513	2.402	1.985	1.513	2.430	1.852	1.500	2.430	1.852	1.500	2.418	1.959	1.500
218	279	377	232	314	380	232	314	380	310	375	493	310	375	493	339	445	549	339	445	549	420	519	678
21,3	29,5	43,7	28,5	42,3	51	28,5	42,3	51	43,7	51	63,5	43,7	51	63,5	49,2	63,5	75,3	49,2	63,5	75,3	50,8	66,9	93,5

que ajusta la entrega de combustible a la demanda, garantizando una pérdida de energía xtremadamente baja, reduciendo el consumo total de energía.

TES 8200				TES 1000							TES 12000									TES 15000								
e-ONE				e-ONE							e-ONE									e-ONE								
8.200				10.000							12.000									15.000								
1.150				1.350							1.350									1.530								
1.100 x 350				1.350 x 450							1.350 x 450									1.600 x 450								
1.250 x 1.060				1.230 x 1.230							1.422 x 1.232									1.404 x 1.404								
9.130				6.000			9.130			11.595		9.130			11.595			17.750			11.595			17.750			25.255		
105	93	105	120	80	93	105	93	105	120	105	120	135	93	105	120	105	120	135	120	135	155	105	120	135	120	135	155	135	155	175
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
4.000	3.668	4.676	6.107	2.322	3.138	4.000	3.668	4.676	6.107	4.676	6.107	7.729	3.668	4.676	6.107	4.676	6.107	7.729	7.069	8.946	11.793	4.676	6.107	7.729	7.069	8.946	11.793	10.020	1.320	16.837
1.500	2.497	1.959	1.500	2.584	1.912	1.500	2.497	1.959	1.500	2.480	1.899	1.500	2.497	1.959	1.500	2.480	1.899	1.500	2.535	2.003	1.519	2.480	1.899	1.500	2.535	2.003	1.519	2.542	1.928	1.513
837	653	832	1.087	486	656	837	653	832	1.087	822	1.074	1.359	653	832	1.087	822	1.074	1.359	1.026	1.299	1.712	822	1.074	1.359	1.026	1.299	1.712	1.279	1.686	2.149
146	89	122	172	73	108	146	89	122	172	113	159	211	89	122	172	113	159	211	146	193	254	113	159	211	146	193	254	176	242	297

presión hidráulica, con uma pérdida de energía extremadamente baja logrando la reducción del consumo total de energia.

HES 16000/17500									HES 20000/22000								
e-ONE									e-ONE								
16.000 / 17.500									20.000 / 22.000								
2.200									2.200								
1.600 x 700									2.000 x 800								
1.820 x 1.620									1.800 x 1.600								
11.595			17.750			25.255			17.750			25.255			60.400		
105	120	135	120	135	155	135	155	175	120	135	155	135	155	175	155	175	200
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
4.676	6.107	7.729	7.069	8.946	11.793	10.020	13.208	16.837	7.069	8.946	11.793	10.020	13.208	16.837	21.700	27.661	36.128
2.480	1.899	1.500	2.535	2.003	1.519	2.542	1.928	1.513	2.535	2.003	1.519	2.542	1.928	1.513	2.786	2.185	1.673
822	1.074	1.359	1.026	1.299	1.712	1.279	1.686	2.149	1.026	1.299	1.712	1.279	1.686	2.149	1.751	2.232	2.915
113	159	211	146	193	254	176	242	297	146	193	254	176	242	297	218	288	350

HES 35000/38000									HES 50000/55000								
e-ONE									e-ONE								
35.000 / 38.000									50.000 / 55.000								
2.300									3.000								
2.200 x 1.000									2.300 x 1.300								
2.300 x 2.000									2.500 x 2.300								
60.400			75.900			11.5000			75.900			11.5000					
155	175	200	175	200	230	200	230	260	175	200	230	200	230	260			
20	20	20	20	20	20	20	20	20	20	20	20	20	20	20			
21.700	27.661	36.128	28.863	37.699	49.857	42.412	56.089	71.675	28.863	37.699	49.857	42.412	56.089	71.675			
2.786	2.185	1.673	2.928	2.012	1.522	2.736	2.069	1.619	2.928	2.012	1.522	2.736	2.069	1.619			
1.751	2.232	2.915	2.012	2.697	3.475	2.958	3.912	4.999	2.012	2.697	3.475	2.958	3.912	4.999			
218	288	350	256	344	412	301	408	472	256	344	412	301	408	472			

Productos Romi

Romi Primax Serie
De 450 a 1500 tons

La Romi Primax R (hidráulica) y Romi Primax H (híbrida) han sido diseñados para cumplir con los requerimientos del mercado del plástico.

Esta serie de máquinas ofrece una precisión, fiabilidad y robustez a través de su sofisticado sistema hidráulico impulsado por válvulas proporcionales de alta rendimiento.

		Primax 450				Primax 600		
Control panel		CM 10				CM 10		
Fuerza de cierre del molde	kN	4.500				6.000		
Carrera máxima de apertura	mm	880				1.000		
Altura del molde (max - min)	mm	880 x 250				1.000 x 300		
Espacio entre columnas	mm	800 x 800				920 x 920		
Clasificación EUROMAP		3.428				7.741		
Diámetro del tornillo	mm	75	80	90	100	100	115	125
Razón del tornillo	L/D	25	23	20	18	24	20	18
Volumen máximo de inyección	cm^3	1.458	1.658	2.098	2.590	3.611	4.775	5.642
Presión máxima de inyección	bar	2.554	2.245	1.774	1.436	2.327	1.760	1.490
Razón de inyección	cm^3/s	357	405	515	635	520	700	825
Capacidad de plastificación (PS)	g/s	83	100	142	195	148	225	290

Romi Velox Serie
De 150 a 1100 tons

La Romi Velox H, serie de máquinas híbridas, ha sido desarrollada especialmente para el sector del mercado que demanda ciclos rápidos para producir piezas de pared delgada. Está equipada con un husillo de plastificación especial, con perfil geométrico para poliolefinas y una relación de 24:1 L / D, lo que aumenta en un 70% su capacidad de plastificación y reduce en un 50%

		Velox H 150	Velox H 220	Velox H 300
Control panel		CM 10	CM 10	CM 10
Fuerza de cierre del molde	kN	1.500	2.200	3.000
Carrera máxima de apertura	mm	460	560	650
Altura del molde (max - min)	mm	520 x 160	630 x 200	750 x 200
Espacio entre columnas	mm	460 x 460	560 x 560	650 x 650
Clasificación EUROMAP		873	1.429	2.181
Diámetro del tornillo	mm	45	55	65
Razón del tornillo	L/D	25	24	25
Volumen máximo de inyección	cm^3	350	618	995
Presión máxima de inyección	bar	2.712	2.512	2.379
Razón de inyección	cm^3/s	970	1.050	1.200
Capacidad de plastificación (PS)	g/s	40	50	70

Romi Primax DP Serie
De 1300 a 5500 tons

La Romi Primax DP, serie con dos platos y un sistema de cierre hidromecánico, es extremadamente resistente y adecuado para piezas de gran tamaño. El concepto de máquina híbrida proporciona un alto rendimiento y menor consumo de energía.

		Primax DP 1300			Primax DP 1500			Primax DP 2200		
Control panel		CM15			CM15			CM15		
Fuerza de cierre del molde	kN	13.000			15.000			22.000		
Carrera máxima de apertura	mm	2.400			2.400			2.200		
Altura del molde (max - min)	mm	1.400 x 700			1.400 x 700			2.000 x 800		
Espacio entre columnas	mm	1.550 x 1.350			1.550 x 1.350			1.820 x 1.620		
Clasificación EUROMAP		17.290			17.290			17.750		
Diámetro del tornillo	mm	135	145	160	135	145	160	120	135	155
Razón del tornillo	L/D	20	20	20	20	20	20	20	20	20
Volumen máximo de inyección	cm^3	9.304	10.733	13.069	9.304	10.733	13.069	7.069	8.946	11.793
Presión máxima de inyección	bar	2.018	1.749	1.436	2.018	1.749	1.436	2.535	2.003	1.519
Razón de inyección	cm^3/s	1.100	1.270	1.550	1.100	1.270	1.550	1.026	1.299	1.712
Capacidad de plastificación (PS)	g/s	240	300	360	240	300	360	141	179	211

En la solución híbrida, esta serie ofrece una flexibilidad y la simultaneidad de todos los movimientos. La plastificación eléctrica ofrece una alta eficiencia, ahorro de energía y bajas emisiones de ruido.

Primax 800			Primax 1100			Primax 1300			Primax 1500		
CM 10			CM 10			CM 10			CM 10		
8.000			11.000			13.000			15.000		
1.170			1.370			1.500			1.500		
1.170 x 300			1.370 x 400			1.500 x 500			1.500 x 500		
1.060 x 1.060			1.250 x 1.250			1.420 x 1.420			1.400 x 1.400		
9.918			12.701			17.290			17.290		
115	125	135	125	135	145	135	145	160	135	145	160
25	20	19	22	20	19	21,5	20	18	21,5	20	18
5.191	6.133	7.153	6.746	7.868	9.077	9.304	10.733	13.069	9.304	10.733	13.069
1.910	1.617	1.383	1.883	1.614	1.399	1.859	1.611	1.323	1.859	1.611	1.323
850	1,007	1.175	865	1,006	1.160	875	1,006	1.180	875	1.006	1.180
171	219	276	250	315	390	240	300	360	240	300	360

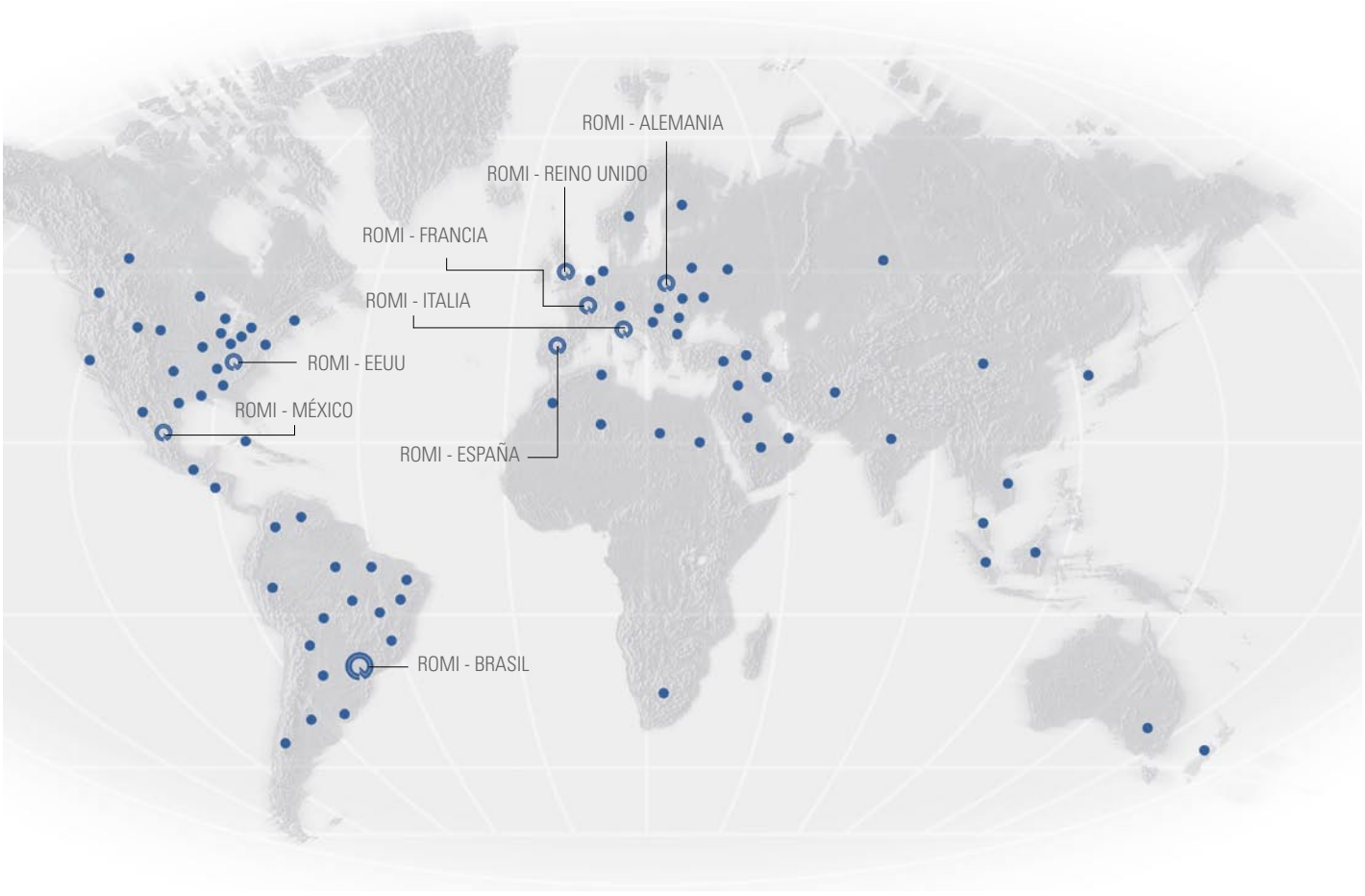
la cantidad necesaria de material debido a su mejora en la homogeneización de material plástico. Su sistema hidráulico es impulsado por servoválvulas y válvulas proporcionales.

Velox H 380	Velox H 450	Velox H 600	Velox H 800	Velox H 1100
CM 10	CM 10	CM 10	CM 10	CM 10
3.800	4.500	6.000	8.000	11.000
750	880	1.000	1.170	1.370
750 x 200	880 x 250	1.000 x 300	1.170 x 300	1370 x 400
700 x 700	800 x 800	920 x 920	1.060 x 1.060	1.250 x 1.250
2.181	3.428	5.017 7.741	7.741 9.918	9.918 12.701
65	75	90 100	100 115	115 125
25	25	25 24	24 25	25 22
995	1.458	2.416 3.611	3.611 5.191	5.191 6.746
2.379	2.554	2.272 2.143	2.143 1.910	1.910 1.883
1.200	1.600	2.200 2.500	2.500 2.400	2.400 2.500
70	105	130 162	162 214	214 252

Con acumuladores para todos los movimientos, requiere menos potencia instalada y las bombas más pequeñas logran una alta eficiencia energética y movimientos rápidos.

Primax DP 2500			Primax DP 3000			Primax DP 3800			Primax DP 5500		
CM15			CM15			CM15			CM15		
25.000			30.000			38.000			55.000		
2.200			2.300			2.300			3.000		
2.000 x 800			2.100 x 900			2.200 x 1.000			2.300 x 1.300		
2.000 x 1.700			2.100 x 1.800			2.300 x 2.000			2.500 x 2.300		
25.255			31.800			60.400			75.900		
135	155	175	135	155	175	155	175	200	175	200	230
20	20	20	20	20	20	20	20	20	20	20	20
10.020	13.208	16.837	12.510	16.500	21.030	21.700	27.661	36.128	28.863	37.699	49.857
2.542	1.928	1.513	2.542	1.928	1.513	2.786	2.185	1.673	2.682	2.012	1.522
1.279	1.686	2.149	1.279	1.686	2.149	1.751	2.232	2.915	2.012	2.627	2.475
172	211	254	207	254	297	248	297	350	294	350	412

Presencia en el mundo



Para informaciones técnicas adicionales y actualizadas visite nuestro sitio: www.romi.com
Reglamentación de seguridad CE disponible solamente para la Comunidad Europea o bajo consulta

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ISO 14001:2004
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Línea Romi Sandretto / ES / AB / 012012 - Especificaciones técnicas sujetas a alteraciones sin previo aviso. Impreso en Brasil - Por favor, recicle siempre.

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FICHA TÉCNICA

SBR

Composición

Caucho Estireno Butadieno

Características

El SBR es un caucho de calidad comercial, para usos generales que no necesite especial resistencia al calor o al envejecimiento.

Propiedades		Unidades	Valores
Composición		Estireno Butadieno	
Color		Negro	
Peso específico		1,6 ±0,05	gr/cm^3
Dureza		70 ± 5	SHORE A
Carga de rotura		≥ 3	Mpa
Alargamiento a la rotura		≥ 250	%
Resistencia al desgarro		12	N/ mm
Temperatura mínima de servicio		-25	ºC
Temperatura máxima de servicio		70	ºC
Envejecimiento por aire caliente	72 h x 70ºC		
Inc. Dureza		10	SHORE A
Inc. Carga de rotura		-20	%
Inc. Alargamiento		-40	&
Resistencia Química			
Ozono		Moderada	
Ácidos y Álcalis diluidos		Moderada	
Ácidos y Álcalis concentrados		No recomendada	
Prod. Químicos orgánicos		Buena	
Disolventes orgánicos		No recomendada	

Goodfellow 15 de mayo de 2014 12:13:37 CET

Acero Inoxidable - AISI 410 - Hoja

Fe/Cr12.5

Última actualización
9 de mayo de 2014
FE260450

1 de 1

Si el producto mostrado no es exactamente el requerido por favor háganoslo saber mandandonos un mensaje

Espesor :0,5 mm

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Tamaño				
Código pedido	Tamaño	1 Pza	2 Pzas	5 Pzas
082-361-33	50x50 mm	EUR 154,00	EUR 184,00	EUR 240,00
149-065-05	100x100 mm	EUR 216,00	EUR 271,00	-
716-196-77	200x200 mm	EUR 341,00	-	-

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Embalaje — Embalajes incluidos en el precio

Condiciones de envío

Material — Acero Inoxidable - AISI 410 Hoja

Tolerancias

Espesor:	<0,010 mm	±25 %
	0,01-0,05mm	±15 %
	>0,050 mm	±10 %
Tamaño (dimensiones lineales):	<100 mm	±1 mm
	>100 mm	+2 % / -1 %
	>100 mm	+2 % / -1 %

1 de 1

Volver al inicio

Goodfellow 15 de mayo de 2014 12:08:49 CET

1 de 1

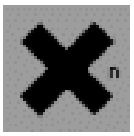
Acero Inoxidable - AISI 304 - Malla

Fe/Cr18/Ni10

Última actualización
9 de mayo de 2014
FE228710

Imprimir esta página

Apertura nominal : 0,38 mm
Espesor : 0,75 mm
Diámetro del hilo : 0,25 mm
Hilos/Pulgada : 40x40
Superficie Abierta : 37 %
Típo : Tejido llano



Si el producto mostrado no es exactamente el requerido por favor háganoslo saber mandandonos un mensaje

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Tamaño Código pedido	Tamaño	1 Pza	2 Pzas	5 Pzas	10 Pzas
530-570-99	100x100 mm	EUR 131,00	EUR 159,00	EUR 230,00	EUR 304,00
321-365-00	150x150 mm	EUR 148,00	EUR 183,00	EUR 267,00	-
170-634-90	300x300 mm	EUR 197,00	EUR 253,00	EUR 378,00	-
329-370-59	600x600 mm	EUR 297,00	EUR 394,00	-	-
171-322-39	900x900 mm	EUR 396,00	EUR 534,00	-	-

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Embalaje — Embalajes incluidos en el precio

Condiciones de envío

Material — Acero Inoxidable - AISI 304 Malla

Tolerancias

Espesor:	tejida: ±10%	
		electromoldeada: ±20%
Diámetro de hilo:	±10%	
Tamaño(dimensiones lineales):	=<100mm	±1mm
	>100mm	+2% / -1%

1 de 1

Volver al inicio

Goodfellow 15 de mayo de 2014 11:53:21 CET

volver a la lista de resultados

1 de 3

resultado siguiente

Polipropileno - Gránulo

PP

Última actualización
9 de mayo de 2014

PP306312

Imprimir esta página

Tamaño nominale : 5 mm
Estado : Homopolímero
Velocidad de flujo del fundido (MFR) : 6

Si el producto mostrado no es exactamente el requerido por favor háganoslo saber mandandonos un mensaje

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Peso Código pedido	Peso	1 Bote
283-920-04	1 kg	EUR 125,00
490-001-93	2 kg	EUR 174,00
250-247-22	5 kg	EUR 324,00

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Embalaje — Embalajes incluidos en el precio

Condiciones de envío

Material — Polipropileno Gránulo

Tolerancias

Las dimensiones indicadas sonnominales

volver a la lista de resultados

1 de 3

resultado siguiente

Volver al inicio

Goodfellow 15 de mayo de 2014 11:58:50 CET

Polipropileno - Gránulo

PP

Última actualización
9 de mayo de 2014

PP306312

1 de 1

Si el producto mostrado no es exactamente el requerido por favor háganoslo saber mandandonos un mensaje

Tamaño nominale : 5 mm
Estado : Homopolímero
Velocidad de flujo del fundido (MFR) : 6

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Peso

Código pedido	Peso	1 Bote
283-920-04	1 kg	EUR 125,00
490-001-93	2 kg	EUR 174,00
250-247-22	5 kg	EUR 324,00

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Embalaje — Embalajes incluidos en el precio

Condiciones de envío

Material — Polipropileno Gránulo

Tolerancias

Las dimensiones indicadas sonnominales

1 de 1

Volver al inicio

Goodfellow 15 de mayo de 2014 12:01:11 CET

volver a la lista de resultados resultado anterior

5 de 28

resultado siguiente

Polietileno - U.H.M.W. - Plancha

UHMW PE

Última actualización
9 de mayo de 2014
ET303100

Imprimir esta página

Espesor :2,0 mm

Si el producto mostrado no es exactamente el requerido por favor háganoslo saber mandandonos un mensaje

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Tamaño

Código pedido	Tamaño	1 Pza	2 Pzas	5 Pzas	10 Pzas
983-717-50	100x100 mm	EUR 106,00	EUR 114,00	EUR 132,00	EUR 155,00
964-695-32	150x150 mm	EUR 113,00	EUR 124,00	EUR 148,00	EUR 178,00
586-917-39	300x300 mm	EUR 134,00	EUR 154,00	EUR 195,00	-
364-666-23	500x500 mm	EUR 162,00	EUR 194,00	-	-

Haga click en el precio a la cesta de la compra (Los precios están en EUR)

Embalaje — Embalajes incluidos en el precio

Condiciones de envío

Material — Polietileno - U.H.M.W. Plancha

Tolerancias

Espesor:		±10%
	Ceramica	±20%
	Composito	±20%
	Polimer	±20%
Tamaño(dimensiones lineales):	=<100mm	±1mm
	>100mm	+2% / -1%
	<100mm	±1mm
	>100mm	+2% / -1%

volver a la lista de resultados resultado anterior

5 de 28

resultado siguiente

Volver al inicio