



WACKER **SILICONES**

SILICONES IN AUTOMOTIVE ENGINEERING
ALWAYS A STEP AHEAD

CREATING TOMORROW'S SOLUTIONS



MOVE INTO THE FAST LANE
WITH WACKER

WACKER SILICONES – MATERIALS FOR TECHNOLOGY ON THE MOVE

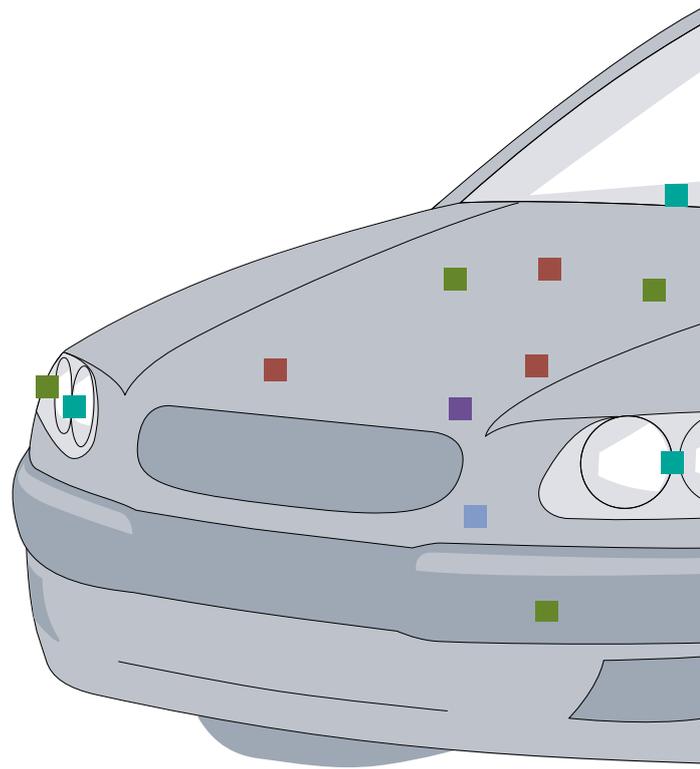
The automotive industry has become completely reliant on modern materials as innovators and pacesetters. After all, innovations and pioneering technologies are impossible without the right materials. WACKER silicones offer impressive qualities across the board, thanks to their diverse applications potential, high quality and versatile properties. Take off for the future now!

Often working behind the scenes, WACKER silicones have made a name for themselves as high-quality, reliable materials for the automotive industry. That is mainly due to their versatile properties and the resulting all-round applications. You will find our products under the hood, in the drive train, in electronics and electrical systems, in car interiors or at seams in the bodywork. Even working in intense heat, they protect against aggressive substances, or act as seals, vibration dampers, conductors or insulators. All this is only possible because the silicone base polymer has such a fascinatingly versatile range of properties.

Silicones from WACKER can do much more. Our innovative products are both catalysts and copilots to the automotive industry. We are there at the beginning of cutting-edge developments, such as lightweight bodywork, hybrid engines or electronic control systems, providing materials tailored to your specific needs. Or we develop ideas for innovative applications ourselves.

As well as creating effective products, WACKER also firmly believes in providing customized service and support. This is the result of our many years of experience and extensive technical know-how in the automotive industry, highly qualified application engineers, state-of-the-art labs and test processes, and strictest quality standards. Our aim is clear — to work with you in defining the ideal silicone product for your application, and create pioneering new materials. You can always count on WACKER, wherever you are in the world. Just contact us!

SOME APPLICATIONS OPTIMIZED BY SILICONES



Engine



- Engine gaskets (CIPG, FIPG)
- Cylinder head gaskets
- Radiator gaskets
- Turbocharger hoses
- Radiator hoses
- Oil-sump gaskets
- Oil-filter gaskets
- Fan couplings
- Air filters
- Vacuum diaphragms
- Engine mounts
- Two-component ventilator louvers
- Torsional dampers

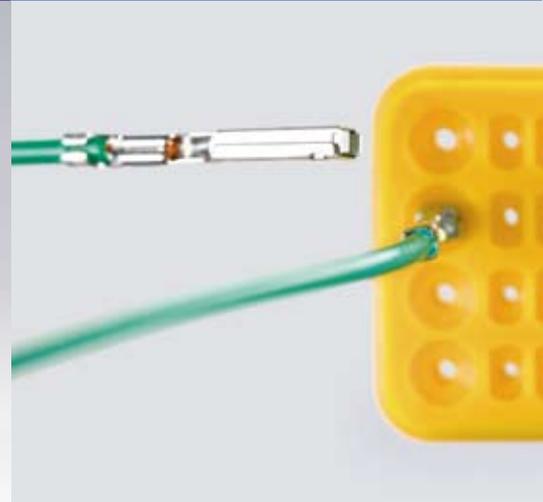
Drive train



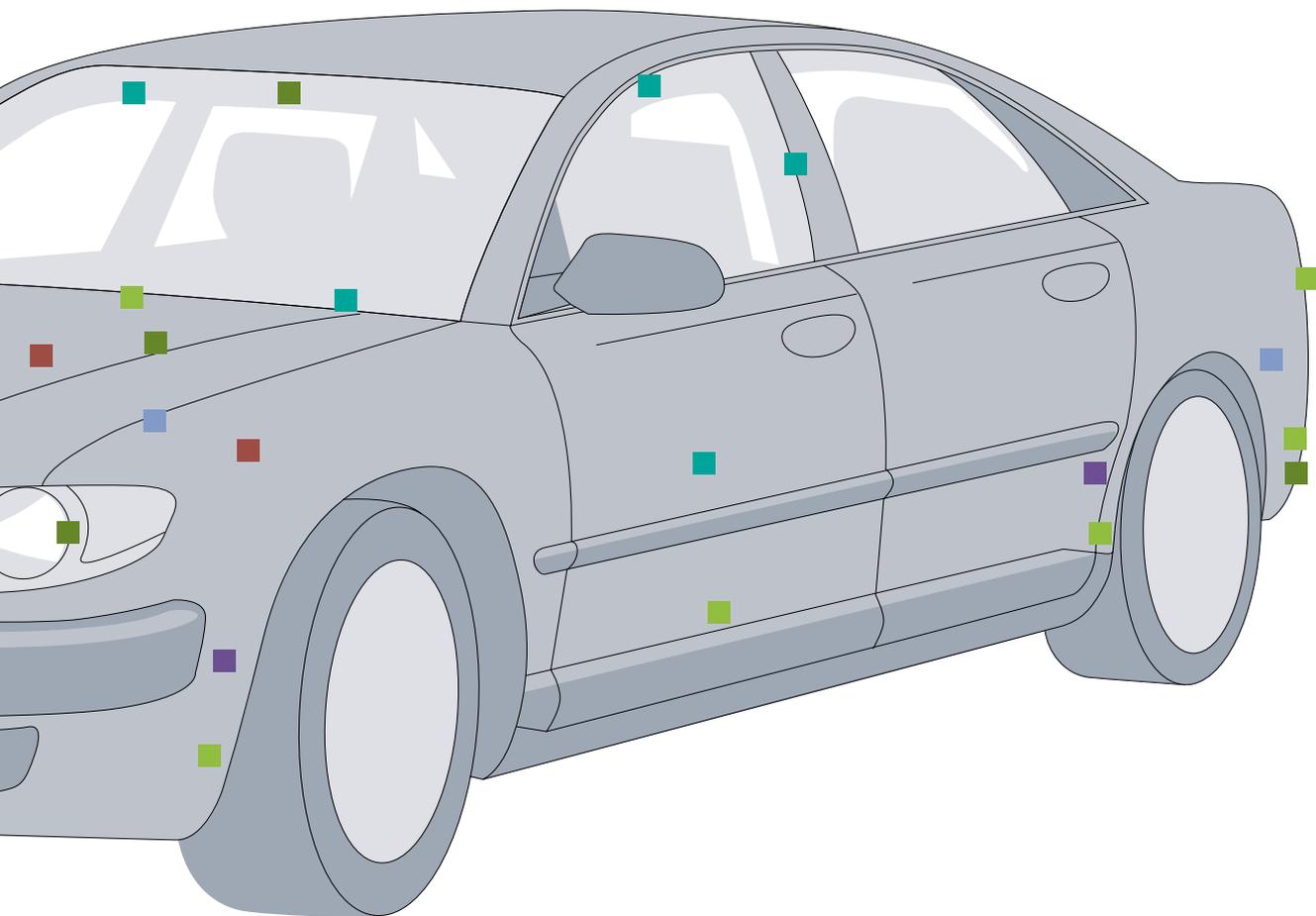
- Viscous couplings
- Hybrid systems
- Transmission and axle seals

Picture of hybrid engine courtesy of ZF Sachs AG

Electrical systems



- Ignition cables
- Spark-plug boots
- Weatherpacks



Electronics

Interior

Body

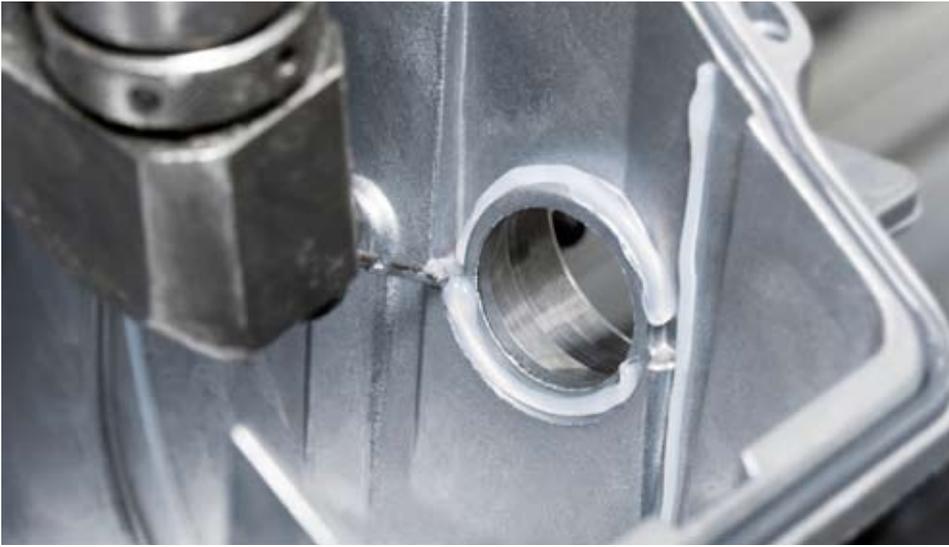


- ABS
- ECUs
- Air-flow meters
- Distance sensors
- Rain sensors

- Airbag
- Viscous dampers
- 2-component multifunction controls
(2-component, self-adhesive LSR)

- Headlamp gaskets
- Exhaust-pipe hangers
- Wiper blades
- Mass dampers
- Bellows
- Brake-protection caps

ENGINE GASKETS FOR EXTRA PERFORMANCE



Silicone rubber grades are suitable for application by either FIPG or CIPG.

Engines need power. And the engine compartment needs high-performance gaskets. They have to operate flawlessly under extreme conditions. RTV silicone rubber grades from WACKER provide reliable and durable sealing even at high temperatures and in contact with aggressive fluids such as engine oil and coolants. In this respect, they guarantee improved performance.

Tuning with Silicone Gaskets

Modern engines require modern sealing technologies. Our silicone rubber grades are therefore not prefabricated but applied directly and fully automatically as FIPG (formed-in-place gaskets) or CIPG (cured-in-place gaskets). That provides a host of benefits, such as reduced material consumption, simplified stockkeeping and simpler groove design. Moreover, there is no need to specially machine the flange surfaces, and the gaskets automatically stay securely in place until assembly.

Performance-Enhancing Properties

- Rapid curing
- Optimum adhesion
- Outstanding resistance to oil and coolant
- Good heat resistance
- Low compression set

Dynamic Product Solutions

For fully automated manufacture of gaskets in the engine compartment, we recommend our silicone rubber grades ELASTOSIL® N, ELASTOSIL® E, ELASTOSIL® RT und ELASTOSIL® LR.

TURBOCHARGER HOSES THAT TAKE EXTREMES IN THEIR STRIDE



Turbocharger hoses are designed for temperatures up to 225 °C. Only ELASTOSIL® R 760/70 can handle such heat.

Powerful diesel engines use exhaust-gas turbochargers to precompress the – intake air. Therefore, turbocharger hoses must operate permanently at high temperatures and under severe mechanical loading. WACKER silicone rubber is essential for the manufacture of such resilient hoses.

For Top-Quality Turbocharger Hoses

Exhaust-gas turbochargers exploit the energy of the exhaust gas. The engine is charged with precompressed air, and the performance and torque are increased significantly. The turbocharger hoses carrying the compressed air permanently operate under extreme temperatures up to 225 °C. At the same time, they must be able to handle the huge pressure waves that are created during compression in the turbocharger. So far, only WACKER silicones can withstand such severe conditions. Our silicone rubber is now key to manufacturing effective turbocharger hoses. Moreover, the material has some impressive advantages. For example, it can be readily processed with other materials to form multicomponent systems.

Harsh Operating Conditions

- High heat resistance
- Good and permanent resistance to severe mechanical stresses, such as pressure fluctuations and pressure waves
- Easy to cure without further additives

Product Solutions for Turbocharging Pressures

ELASTOSIL® R 760/70 has been specially developed for extrusion of turbocharger hoses, and ideally meets the challenges specific to this application. Thanks to its high green strength, the uncured hose preform doesn't collapse during manufacturing and processing, and bonds well to the other layers of the turbocharger hose.

FOR EFFICIENT INSULATION OF HYBRID ENGINES



The electric propulsion unit in hybrid engines must be specially protected against moisture, dirt and temperature fluctuations. That is the job of SEMICOSIL® and ELASTOSIL®.

As fuel prices rise, hybrid engines have established themselves as the drive concept of the future. The innovative properties of WACKER SILICONES make them ideal for encapsulating the electronic control systems and optimizing heat dissipation.

Keeping on the Move with Silicones

Serial hybrid engines are based on an electrical propulsion unit that is installed directly in the drive train between the engine and transmission. The rotor is mounted on the drive shaft and rotates with it, while the windings and electronic control unit are incorporated into the engine housing. To ensure the components run smoothly at all times, the electronic control unit is reliably encapsulated in a one-part, heat-curing silicone elastomer from WACKER. That keeps moisture and dirt out permanently. But our products are also ideal for impregnating individual coils and insulating the circuitry of individual coil formers. This gives electric motors the necessary short-circuit resistance, while improving heat dissipation.

The Ideal Properties for Protection

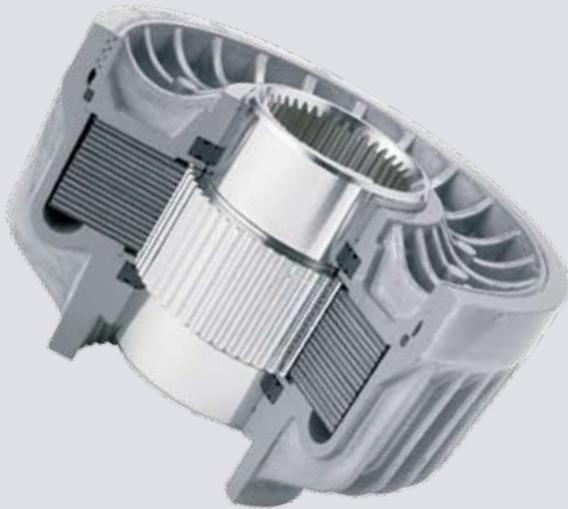
- Good electrical insulation
- Protection against water, temperature fluctuations and salts
- Shrink-free curing

Product Solutions for Hybrid Engines

Our products SEMICOSIL® and ELASTOSIL® RT are used for sealing control housings. WACKER silicone resins have been specifically developed for impregnating windings. Applied by dip impregnation, they permanently protect the winding while eliminating voids. This improves heat dissipation and insulation. For encapsulating connector rings, we recommend ELASTOSIL® RT products.

Picture of hybrid engine courtesy of ZF Sachs AG

MORE DRIVE POWER THANKS TO SILICONES



WACKER silicones also show their true strengths as fillers in modern viscous couplings. Our products ensure simple, reliable, continuous and maintenance-free power transfer from the engine to the transmission. That's how powerful silicones can be.

More Torque with Silicones

Viscous couplings, with their capability for continuous power transmission with increasing torque, would be unthinkable in their current form without silicones. Silicone fluids from WACKER make this form of power transmission possible. The key property for this application is the high stability of our silicone fluids. Only this ensures permanently reliable and simple power transmission, particularly in viscous couplings in SUVs and offroad vehicles.

The fact that the viscosity of silicone fluids is relatively independent of temperature makes these materials ideal for use in viscous dampers, where shearing rates are high.

Properties of the Fluid

- Long lifetime at high temperatures and high shear rates
- Low torque fade after long running times
- Low temperature-dependency of torque
- Low temperature-dependency of viscosity

Powerful Product Solutions

The property profile of WACKER® silicone fluids AK-STAB and AK-VISC makes them outstanding filling media in viscous couplings. Of course, we also provide a wide range of silicone fluids for this application with different viscosities.

TOTAL PROTECTION FOR THE IGNITION

Silicone rubber grades generally show good insulation and high electrical conductivity in specialty applications. And precisely these properties are essential in ignition cables and spark plug boots an.

No engine will start properly unless the compressed fuel-air mixture ignites with 100 percent efficiency. WACKER silicones are the ideal protection for ignition cables and spark plug boots against moisture, temperature cycles and salt. They ensure that the ignition spark is generated perfectly every time.

Full Protection for Ignition Cables

The ignition cable is the high-voltage cable connecting the distributor and spark plugs. Such a key component of all modern ignition systems must be properly protected. Precisely this function is performed by the silicone rubber sheathing. Our silicones also have a proven track record in the conductive core of ignition cables. The silicone core helps to suppress electromagnetic interference. There is then no need for an interference-suppression resistor in the spark plug boot.

Reliable Ignition

Advantages of the silicone sheathing:

- High dielectric strength
- Good mechanical properties
- High volume resistivity

Advantages for the core:

- Low volume resistivity
- Low temperature-dependency of conductivity
- Good adhesion to the substrate

Protective and Conductive Products

Our high-voltage-resistant ELASTOSIL® R 562/80 grade has proven ideal as inner sheath material. We also offer ELASTOSIL® R 420/70, an optimum product for the outer sheath. ELASTOSIL® R 570/70 or ELASTOSIL® R 573/70 are extrusion coated onto the substrate (glass or aramid fiber bundles) to form a conductive inner core.

Ignition Plugs that are Certain to Function Properly

The plug connection between the high-voltage cable and spark plug is a key factor in optimum ignition. Silicone-rubber ignition plugs are impressive for their excellent insulation properties and long lifetime, even under permanent hot conditions.

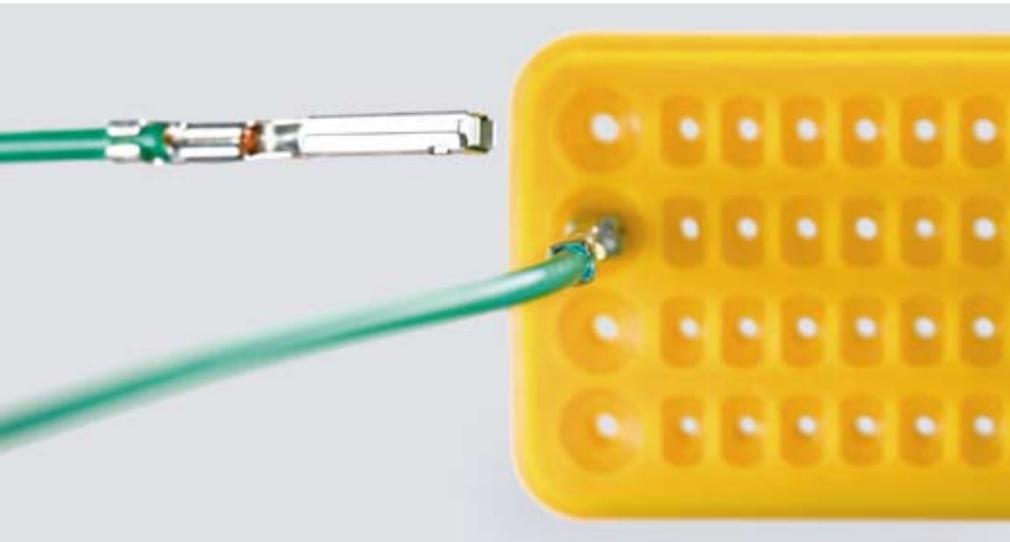
Plugs Deserve only the Best

- Reliable protection against water splashes, damp and dirt
- Good electrical insulation
- High dielectric strength
- Avoiding corona effects
- High heat resistance

Faultless Product Solutions

Ideal for manufacturing spark plugs: ELASTOSIL® R or ELASTOSIL® LR.

WEATHERPACKS FOR THE HARSHTEST CONDITIONS



Automotive applications subject weatherpacks to the toughest conditions. WACKER's self-lubricating silicone rubbers are ideal for protecting and insulating these important electrical components. That is why they can withstand any weather.

Indestructible Weatherpacks

High temperatures, dirt, moisture or gasoline fumes – weatherpacks must be more than a match for the harshest conditions. At the same time, they must be easy to fit. With self-lubricating silicone rubber grades from WACKER, they can do both. The microscopic film produced during self-lubrication protects them permanently and reliably against the environmental influences while facilitating fully automated assembly. Whether for starting up on a frosty morning or running at high temperatures for long periods, weatherpacks with our silicone seals will perform their function reliably over the vehicle's entire lifetime.

ELASTOSIL® LR and ELASTOSIL® R *plus* silicone rubber grades are oil-bleeding. That makes assembly easier and protects the plug connections against external influences of all kinds.

For Extreme Demands

- Permanent sealing
- Optimum self-lubrication
- High heat resistance
- Fully automatic injection molding with no secondary processing
- Excellent aging and weathering resistance

Products for Permanent Insulation

ELASTOSIL® LR and ELASTOSIL® R *plus* oil-bleeding silicone rubber grades are ideal for manufacturing housing seals, mat seals for multi-pin plugs and single-wire seals.

Our newly developed, non-oil-bleeding ELASTOSIL® LR 3065 grade, with its low coefficient of friction, is an innovative alternative for all plug connections.

ELECTRONIC CONTROL UNITS THAT DON'T KNOW THE MEANING OF FAILURE



Depending on the application and processing technology, we have a whole range of specialty products for encapsulating and bonding electronic components.

The comfort, safety and fuel efficiency of modern automobiles are partly governed by the quality of the electronic control units. Silicone elastomers from WACKER achieve 100% reliability with sensitive electronic control and safety systems, such as engine controllers, airflow meters, airbags or antilock braking systems. After all, who can afford a system failure?

Reliable Electronic Controls

Electronic control units are the electronic modules that perform control functions throughout the vehicle. Nowadays, new vehicles contain more than ten ECUs. Within the control units, WACKER silicone elastomers are ideal for bonding and encapsulating electronic components. They provide a perfect seal for housing components against external influences. At the same time, as extremely low-viscosity silicone encapsulants, they permanently seal the metal plug pins with respect to the thermoplastic housing.

Properties only for Control Systems

- Outstanding flow and pseudoplasticity
- High heat resistance and flexibility
- Good damping properties
- Specified low ion-content
- Long pot life together with rapid curing of the order of minutes

Products for Bonding, Sealing and Encapsulation

Our specialty solution for all encapsulation purposes in electronic modules: silicone gels of the SEMICOSIL® and WACKER SILGEL® brands. In high-volume applications with very short cycle times, we recommend special UV-curing SEMICOSIL® UV silicones. ELASTOSIL® and SEMICOSIL® adhesives are ideal for bonding and sealing individual parts or housings.

AN ALL-ROUND EXPERT IN MULTIFUNCTION CONTROLS



Styling and durability are crucial to the subjective quality impression of a vehicle interior. Versatile combinations of materials, such as two-component silicone-thermoplastics, are therefore used in the production of multifunction controls. With its outstanding translucency and good haptic properties, this material combination provides the finishing touch – giving vehicles an attractive, high-quality feel.

Multifunction Controls that Shine

Small assemblies, such as multifunction controls, are most economical if produced in large series and as few operations as possible. That is why they are increasingly being manufactured with self-adhesive liquid silicone rubber from WACKER. They can be easily produced by two-component thermoplastic injection molding. The different components have clearly defined functions: the soft component, which executes the individual switching functions, is an ELASTOSIL® LR 3070/40 membrane. This silicone membrane is bonded to a polyamide frame and overlaid with two thermoplastic coats. The thermoplastic overlay is then laser etched to produce the backlit control symbols. The high transparency of the WACKER silicone provides a uniform backlit design.

ELASTOSIL® LR 3070/40 is transparent, permitting multifunction controls with backlite designs

Impressive Effects

- High transparency
- Good haptics and finger guidance
- Outstanding water resistance, dust tightness and abrasion resistance
- Outstanding resistance to cleaning agents

Product Solutions with Multicomponent Materials

Ideal for two-component thermoplastic injection molding: transparent ELASTOSIL® LR 3070/40. The multi-component silicone/thermoplastic material lends itself readily to a range of important functions, such as outstanding haptics and finger guidance, and optimum protection of the multifunction control electronics.

SEALING AND DAMPING CAR BODIES



Long-term protection of headlamps and permanent bonding – all with silicone rubber gasket profiles.

Elastomer exhaust hangers effectively damp mechanical and acoustic vibrations.

Vehicle bodies consist of countless small and large parts that fulfill diverse functions. They seal or damp at high and low temperatures and in wet or dry conditions. They must withstand UV radiation as well as corrosive fluids. This is only possible with ELASTOSIL® silicone rubber grades. They have the flexibility, efficiency and reliability to meet your demands.

Headlamps – a Shining Example

Leaky headlamps that trap water are a safety risk. Silicones seal them permanently and reliably.

Properties that Keep their Promise

- Good adhesion and sealing
- Good heat resistance
- Easy and inexpensive application of seals
- Low emissions of volatiles

Product Solutions with the Seal of Approval

To seal the headlamp lens with respect to the housing, we recommend our ELASTOSIL® N or ELASTOSIL® RT silicone rubber grades.

For Watertight Sunroofs

The latest generation of sunroofs are mechanically complex components made in ever larger dimensions. Silicone rubber meets the ever tougher demands on the gasket profiles.

Properties for Exterior Use

- Outstanding heat resistance
- Good weathering and UV resistance
- Good low-temperature flexibility

High-Profile Products

ELASTOSIL® R makes sunroofs absolutely watertight.



Heat-Defying Exhaust Hangers

The standard installation of catalytic converters in all vehicle classes results in higher exhaust system temperatures. This requires the use of silicone rubber hangers. They possess constant damping properties over a wide temperature range.

Damping and Filtering Requirements

- Very good heat resistance
- Uniform damping properties at high and low temperatures
- High dynamic loading capacity

Support Products

ELASTOSIL® R exhaust hangers absorb mechanical and acoustic vibrations without generating any heat themselves.

For Shock Absorbers with Good Resonance

Shocks, shuddering and vibrations are unpleasant not only for the car users, but also for the car itself. WACKER silicone fluids and elastomers are used for damping.

Low-Vibration

- Optimum damping
- Loss angle can be adjusted to requirements
- Uniform damping properties at high and low temperatures

Products for Acoustic Protection

ELASTOSIL® R or ELASTOSIL® LR silicone rubber grades in mass dampers and vibration absorbers for effective damping of noise and vibrations.

Multitalented Foam Insulation

Higher temperatures in modern engines, tighter specifications for noise reduction and stricter safety regulations require a multitalented product – WACKER silicone foam.

Properties with a Flexibility Guarantee

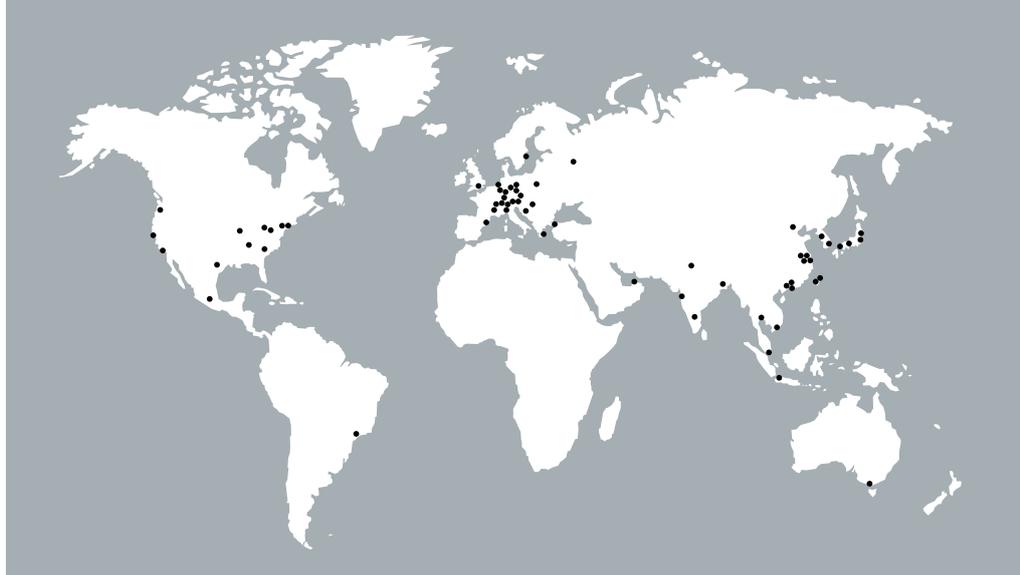
- Good acoustic insulation
- Extreme heat resistance
- Flame resistance
- No toxic combustion gases

Versatile Products

ELASTOSIL® SC is the material of choice for the many sealing and damping tasks in the engine and body areas.



WACKER AT A GLANCE



WACKER

is a technology leader in the chemical and semiconductor industries and a worldwide innovation partner to customers in many key global sectors. With 15,000 employees, WACKER generated sales of €3.78 billion in 2007. Germany accounted for 19% of sales, Europe (excluding Germany) for 27%, North and South America for 17% and Asia-Pacific, including the rest of the world, for 37%. Headquartered in Munich, Germany, WACKER has 27 production sites worldwide and a global network of over 100 sales offices.

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.

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 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.

WACKER FINE CHEMICALS

As an expert in organic synthesis, silanes and biotechnology, WACKER FINE CHEMICALS supplies innovative biotech products and catalog chemicals for life-science and consumer-care customers worldwide. Its product portfolio includes cyclodextrins and cysteine, organic intermediates and acetyl acetone. A key specialty is the contract manufacturing of pharmaceutical proteins via microbial systems.

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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