

WACKER

CREATING TOMORROW'S SOLUTIONS



MOBILITY

DRIVING TOMORROW'S e-NOVATION
e-MOBILITY POWERED BY SILICONES



WACKER

LET'S DRIVE CHANGE!

e-Mobility

Governments around the globe are making the reduction of CO₂ emissions a top priority. The automotive industry has responded by electrifying the powertrain. Concepts range from mild hybrids to the full electric vehicle. Silicones are part of these concepts, acting as bonding, sealing, potting or coating materials, ensuring top performance, functionality and a long service life. Thermally conductive silicones assist in dissipating heat generated by the compact design of electric components.

The automotive industry is facing probably the biggest challenges in its history - challenges which also affect auto-industry suppliers. We all need to think differently, develop new technological approaches and new materials to meet these changing technical demands. WACKER is one of the most research-intensive chemical companies in the world, with a long history of inventing, modifying and tailoring silicones to the changing needs of the automotive industry.

Talk to us!

Together we can turn challenges into success.

SILICONES: A RELIABLE SOLUTION FOR NEW CHALLENGES

As silicones can always be taken to the limits, they are the perfect materials for extreme conditions, such as those found in automotive and, more especially, e-mobility applications.

Double Expertise

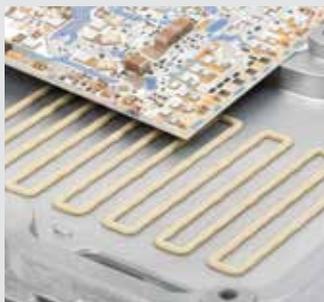
We have a proven record in combustion engine cars, working with major industry players in automotive parts and automotive electronics. We also have decades of experience working with the semiconductor industry. This adds up to an excellent starting position for the future.

Now in Pole Position.

As Technical Demands Rise, Silicones are ever Increasingly the Materials of Choice.

Thermal Management

- Silicones maintain their properties over a broad temperature range (heat-resistant up to 180 °C in standard products, up to 230 °C in special products)
- Thermally conductive silicones assist in dissipation of heat (thermal management)



Functional Safety

- Sealing and protection vs humidity, media and environmental stress
- Electric insulation: constant over a broad range of temperature and frequency
- Excellent vibration damping from -45 °C up to > 180 °C



Protection of Sensitive Electronics

Gel-type materials with low E-modulus protect against external influences and transmission of mechanical stress. Products with low level of volatile siloxanes are available.



Efficiency for Processing and Production

- Silicones make technology fast, easy and affordable
- Silicones' properties (flow, adhesion, cure) can be adjusted to suit different production processes
- Automated mass production possible



Our Products: ELASTOSIL®, SEMICOSIL®, SILRES®, WACKER SiGel®

Silicones in an Electrified Powertrain

Battery

- Sealing of battery module
- High voltage cables & connectors
- Sealing of battery housing
- Potting of electronics in battery management system
- Couple cells for vibration control (bonding)
- Thermal management
- Coupling of cells/modules to active cooling

Booster

- Connector sealing
- Housing sealing
- Potting
- Thermally conductive gap filler or adhesive

Fuel Cell

- Sealing bipolar plates (BPP) and membrane electrode assembly (MEA):
 - Dispensing
 - Screen printing
 - Injection molding

Power Conversion Unit

- Coating
- Connector sealing
- Potting
- Sealing of PCU housing
- Selective potting
- Thermally conductive gap filler or adhesive

Gear-Box-Mounted Hybrid Module

- Active cooling with silicone oil
- Permanent magnet bonding
- Coil impregnation with silicone resins
- Potting coil connector ring / connection box

Direct Drive

- Potting coil connector ring / connection box
- Active cooling with silicone oil
- Coil impregnation with silicone resins/coil potting (full encapsulation)

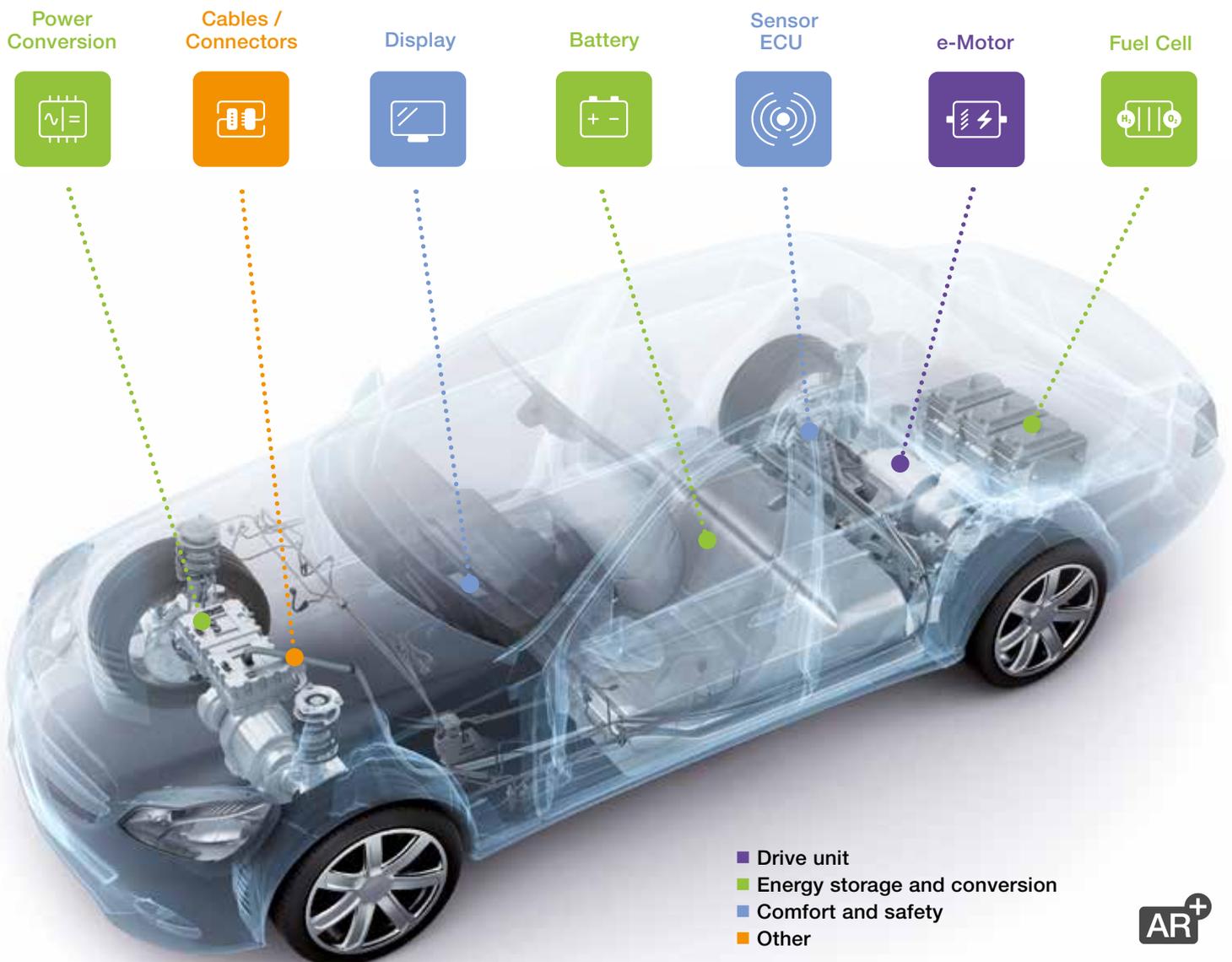
ESSENTIAL ELEMENTS OF e-MOBILITY

Whether in e-motors, power conversion, displays, cables, fuel cells, batteries or sensors – with their exceptional properties, our highly efficient silicones secure pole position in your specific market.

By protecting sensitive electronics and assisting in thermal management, our silicones allow the safe and economical implementation of electrification, autonomous driving and connectivity concepts.

And that is not all: for inductive charging and HVAC systems (e.g. PTC or sheath heaters), our silicones provide reliable results. Coating with flame-retardant silicones makes it possible to use lightweight laminates to separate individual compartments in the car, e.g. the battery from the passenger compartment.

Silicones Support the Key Components in Alternative Drive Cars from Mild Hybrid to Electric and Fuel Cell Vehicles

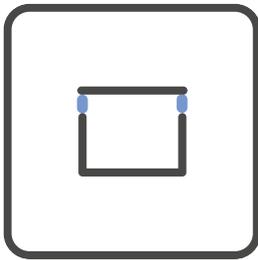


AS VERSATILE AS YOUR PRODUCTION PROCESSES



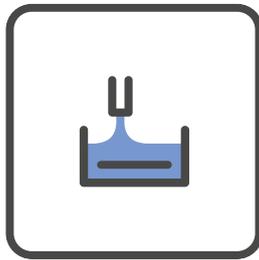
Bonding

Bonding with RTV-1 and RTV-2 silicone adhesives for a flexible bond between different components, e.g. for bonding of seals to housings or for optical bonding in displays.



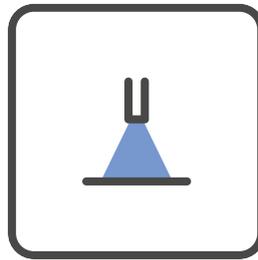
Sealing

Silicone sealants for reliable gaskets, e.g. to seal battery housings or for fuel cell gaskets.



Potting

Silicone gels as encapsulant, e.g. for electrical components in power conversion.



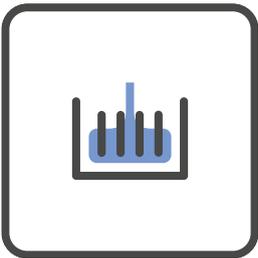
Coating

Sprayable silicones that act as conformal coatings (PCB protection).



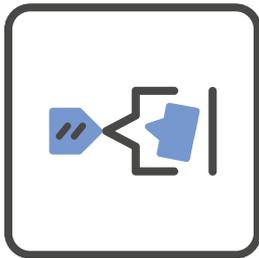
Extrusion

High-consistency silicone rubber (HCR), addition-curing and peroxide curing products, e.g. for extrusion of high-voltage cables.



Impregnation

Coil impregnation in hybrid motors with silicone resins.



Injection Molding

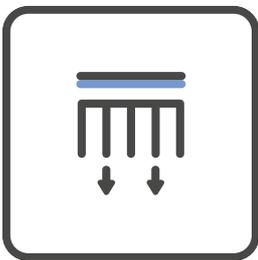
Liquid silicone rubber (LSR); e.g. self-adhesive LSR for 2-part molding of battery connectors.

The automotive industry has always been driven by technical innovation as well as cost and energy efficiency. Our silicone materials make a significant contribution toward enhancing product and process competitiveness in automotive applications.

Thinking Beyond the Product

Our experience extends well beyond the processing of our products. At our technical centers, we extensively test:

- Bonding, sealing, potting and coating using silicone adhesives/gels/resins
- Injection molding with liquid silicone rubber
- Extrusion and molding with high-consistency rubber



Thermal Management

- **Thermally conductive adhesives** conduct heat from the device to the heat sink. At the same time, they create a firm yet flexible mechanical bond that does not require further fixing, thus reducing manufacturing costs. Our silicone-based thermal adhesives exhibit outstanding durability and long-term reliability under permanent thermal stress. The mechanical properties remain almost constant even after 2,000 operating hours at 150 °C.
- **Thermally conductive silicone encapsulants** efficiently dissipate heat even from complicated shapes. At the same time, they protect key components such as transformers and power semiconductor devices against environmental influences. Our solutions are optimized for bubble-free processing, showing good flow properties and low viscosity.
- **Thermally conductive gap fillers and pastes** are an effective alternative where no structural bond between the cooling element and device is required. They efficiently dissipate the heat and can permanently withstand shocks, vibrations and temperature fluctuations due to their soft consistency. Our solutions show a special rheology, forming a thin, homogenous layer that can easily compensate component tolerances. Optimum heat transfer can be achieved with only a very thin layer. Our portfolio today comprises silicone grades with a conductivity of up to 4 W/mK, with higher values being developed. Products with very low content of volatile siloxanes are available, some of them even meet the automotive specification for a D4-D8 siloxane content of less than 350 ppm. Excellent processability has been developed with leading equipment manufacturers. Many of the gap filler materials are available in 200 l drums.



THE FUTURE STARTS NOW – WITH A RELIABLE PARTNER

At WACKER, you will find an unrivaled, specialized portfolio as well as a dedicated partner who breathes automotive and lives innovation. Meet our experts and let's talk about how we can shape the future of mobility.



Quality without Compromise

In an integrated production loop, we manufacture over 3,000 silicone products from only two raw materials. This gives us seamless control and coordination of the entire manufacturing process, ensuring constant high quality that is identical worldwide.

In addition, we have established a quality management system that is exemplary in the chemical industry. Every batch is subjected to the same rigorous tests and controls around the world. Accustomed to delivery after delivery of consistent product quality, leading automotive suppliers and electronics companies have learned to rely on WACKER.

Large-Scale Capacities

We operate our production sites according to the same standards and are currently one of the largest silicones manufacturers worldwide. Our production sites are located in Germany, USA, Korea, China, India and Japan, which makes for short delivery distances.

Dedicated to Service

We maintain technical centers around the globe to develop customized silicone grades for our customers. At the Burghausen technical center, we operate the Global Competence Center for Automotive Electronics with multiple labs, as well as a silicone processing facility with processing machines. At the WACKER ACADEMY, we offer training in silicone chemistry and its applications. Here, we can provide customized silicone grades at all stages of scale-up: from samples to huge quantities.

Fueled by Innovation

WACKER started its success story in the R&D department. Our corporate research facility (Consortium für elektrochemische Industrie) was founded in 1903 and is the core cell of innovation for WACKER. Right now, our experts there are engaged in the development of silicon-based lithium-ion batteries, collaborating closely with cell manufacturers and the automotive industry. Additionally we have a strong application-oriented R&D force, working with clients on their current issues.

EXPERTISE AND SERVICE NETWORK ON FIVE CONTINENTS



WACKER is one of the world's leading and most research-intensive chemical companies, with total sales of €4.92 billion. Products range from silicones, binders and polymer additives for diverse industrial sectors to bioengineered 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 4 business divisions, we offer our customers highly-specialized products and comprehensive service via 23 production sites, 21 technical competence centers, 13 WACKER ACADEMY training centers and 50 sales offices in Europe, North and South America, and Asia – including a presence in China. With a workforce of some 13,800, we see ourselves as a reliable innovation partner that develops trailblazing solutions for, and in collaboration with, our customers. We also help them boost their own success. Our technical centers employ local specialists who assist customers world-

wide 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



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