WACKER

CREATING TOMORROW'S SOLUTIONS

ELASTOSIL®

MOBILITY

e-NOVATION FOR FUEL CELLS
POWERED BY SILICONES

PUTTING FUEL CELLS IN THE FAST LANE

A fuel-cell vehicle (FCV) or fuel-cell electric vehicle (FCEV) is an electric vehicle which uses a fuel cell as a range extender in order to provide electrical energy to the battery and thus extend the vehicle range. Fuel cells generally use oxygen from the air and compressed hydrogen to generate electrical energy for the battery and exhaust condensed water and heat.
The fuel cell is considered to be a highly innovative technology for alternative zero-emission vehicles but there are still technical and logistical challenges such as mass production and hydrogen infrastructure that need to be overcome for market acceptance. WACKER's silicone-based solutions and research efforts support manufacturers in designing reliable long-lasting fuel-cell systems for different production processes, thus contributing to productivity improvement.

e-Novation is Our Business
WACKER is one of the most research-intensive chemical corporations worldwide, with strong R&D that goes far beyond just product development. At our technical centers across the globe we test state-of-the-art silicone sealing and bonding formulations to achieve maximum sealing peformance. Take advantage of the innovative technology and individual service of a strong partner.

Let's power up the future.
Let's put the wheels on e-Mobility.

USING SILICONES MEANS SEALING FOR LIFE

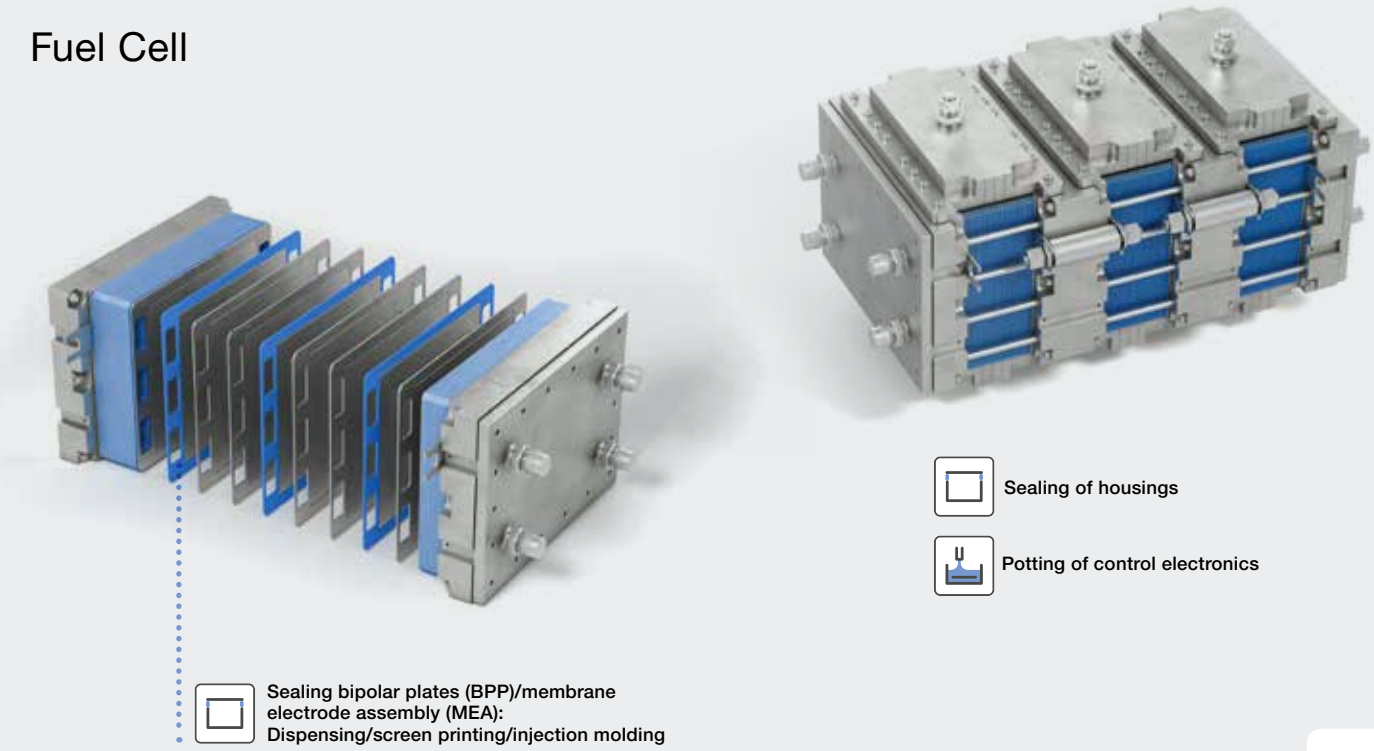
Silicones are used to seal fuel cells. The sealing functionality can be integrated into a cell component (bipolar plate or MEA/membrane electrode assembly) or can be pre-produced and added as an insert gasket during stacking.

Silicone gaskets are chemically inert, i.e. their properties remain stable in a fuel-cell set-up and during operation, and do not negatively affect the fuel-cell performance. They also achieve an excellent compression set, ensuring gas and coolant tightness and thus securing the fuel cell against leakage over its full lifetime. In addition, silicone-based gaskets offer excellent thermal and degradation resistance. This combined effect maximizes the reliability of a fuel-cell power unit and extends its life and performance.

Silicones can be processed in various ways, including injection molding, screen printing, dispensing and bonding.

Silicone Application Fields

Fuel Cell



SILICONE MEANS ECONOMY AND FLEXIBILITY

Whether you are you looking for more quality, consistency, process robustness or improved productivity, or maybe a bonding process that combines all those advantages, WACKER has silicone-based solutions tailored to your process needs.

Injection Molding

Injection molding is used to apply a seal onto bipolar plates, the MEA (membrane electrode assembly) or separate metal or plastic gasket carriers, and allows complex and highly sophisticated seal geometry and topology solutions. Material supplied in drum or hobbock is processed in dosing and mixing equipment, and blended in a static mixer to a very homogeneous material.

Low Pressure Injection Molding

Low pressure molding can be classified as halfway between injection molding and potting. It is mainly used to form a molded-in-place gasket on the porous GDL (gas diffusion layer), with well-controlled saturation. Excellent mold flow, fast cure at low temperature are core material requirements for this process. As the process is much more gentle than conventional injection molding, it can be used for fragile GDL as well.

Screen Printing

Screen printing is a well established process in gasket manufacture. Silicone's well balanced rheology makes it a cost-effective candidate for the fast deposition of precise and homogeneous layers with thicknesses ranging from 30 µm up to 300 µm.

Dispensing

Dispensing is perfectly suited for prototyping or small series because it avoids expensive molds. In addition dispensing provides more flexibility in design and allows the use of a wide variety of materials. Dispensing is often the technology of choice in ramp-up scenarios.

A CHOICE OF RELIABLE SOLUTIONS

Benefit from WACKER's 70 years of silicone research to find a choice of reliable solutions tailored for every fuel-cell sealing application.

Both the MEA (membrane electrode assembly) and GDL (gas diffusion layer) are permanently exposed to hot-humid gas (hydrogen and air). Cured silicones therefore require moisture stability and chemical resistance to reactive intermediates of the electrochemical reaction which is essential for good long-term sealing properties. Thanks to their constant sealing properties over the full range of operating conditions of fuel cells, silicones are ideal sealing materials for this type of application.

ELASTOSIL® RT 624

- Excellent compression set
- Low viscosity and moderately shear thinning, ideal rheology for integrated seals in porous substrates by infiltration (GDL)
- Developed for direct contact to proton exchange membrane, catalyst layer and media supply
- Processing by low-pressure injection molding, dispensing or screen printing
- Low kick-off temperature (95 °C) avoids the drying-out of the proton exchange membrane
- 15 years of experience in automotive fuel-cell applications

ELASTOSIL® RT 621

- Screen-printing grade
- Pseudoplastic / shear thinning
- Good compression set
- Good media resistance under fuel-cell operation
- Suitable for contact to the catalyst layer and polymer electrolyte membrane (PEM)
- Designed for screen printing on bipolar plates, gasket or MEA framework

ELASTOSIL® LR 3003

- Injection molding / overmolding for integrated seals on bipolar plates, MEA
- Good media resistance
- Adhesion by use of Primer G 790
- Suitable for integrated seals on bipolar plates and gasket frameworks

ELASTOSIL® LR 3005 and LR 3025

- Injection molding grade for integrated seals
- Low compression set (non-post cure)
- Good general media resistance in fuel-cell conditions
- EL LR 3025 especially for coolant contact, excellent stability versus radical-initiated degradation
- Low kick-off temperature
- Excellent mechanical properties
- Short cycle times
- Suitable for integrated seals on bipolar plates and gasket frameworks or manifolds

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PRODUCT OVERVIEW
SILICONES FOR FUEL CELLS

Silicone Elastomers for Gaskets

Low compression set, excellent degradation resistance within fuel cell (temperature, acids, hydrogen, oxygen), no inhibition or contamination, low level of volatile siloxanes

Product	Process	Curing Mechanism	Product Type	Viscosity D = 10 1/s [Pa·s] (ISO 2555)	Hardness Shore A DIN 53505	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	Color	UL Listing	Kick-Off Temperature [°C]
ELASTOSIL® RT 624	Screen printing / dispensing / low-pressure injection molding	Addition, heat curing	2-part, 1:1	40	40	5	300	> 14	< 5	Translucent	n.n.	95
ELASTOSIL® LR 3005/30	Injection molding	Addition, heat curing	2-part, 1:1	120	30	6	610	18	15	Translucent	HB (1.5 mm)	130
ELASTOSIL® LR 3005/40	Injection molding	Addition, heat curing	2-part, 1:1	150	40	7.8	610	22	16	Translucent	HB (1.5 mm)	130
ELASTOSIL® LR 3005/50	Injection molding	Addition, heat curing	2-part, 1:1	390	50	9.4	520	24	14	Translucent	HB (1.5 mm)	130
ELASTOSIL® LR 3005/60	Injection molding	Addition, heat curing	2-part, 1:1	480	60	10	400	29	13	Translucent	HB (1.5 mm)	130
ELASTOSIL® LR 3025/40	Injection molding	Addition, heat curing	2-part, 1:1	100	40	6.5	600	18	8	Translucent	n.n.	95
ELASTOSIL® RT 621	Screen printing	Addition, heat curing	2-part, 1:1	12	35	3	220	4	6	Translucent	n.n.	90

WACKER

Wacker Chemie AG
Hanns-Seidel-Platz 4
81737 Munich, Germany
Tel. +49 89 6279-1741
info@wacker.com

www.wacker.com

www.wacker.com/socialmedia

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