

MARKETS // PRODUCTS

OUR PRODUCTS AND SOLUTIONS

FOR THE E-MOBILITY AND
AUTOMOTIVE INDUSTRY

vonRoll

We Enable Energy

As one of the oldest industrial companies in Switzerland, founded in 1803, we focus on products and systems for power generation, transmission and distribution, rotating machines and mechanical engineering. Von Roll is the global market leader for insulation products and the only company to offer the complete range of insulation products, composites, consulting, tests and services for electrical machines.

For more than 100 years, we have been making outstanding contributions to this market, developing a number of highly innovative products that have enabled both steady increases in power output and more compact machines.

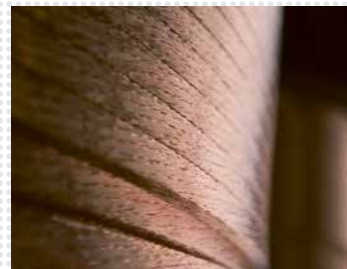
Customers enjoy the following benefits:

- » One single source for all insulating materials
- » Thorough expertise from power generation and transmission to its efficient utilization
- » Proven compatibility for system components
- » Testing at Von Roll of both materials and systems
- » Consulting for applications and technologies
- » Training in insulation materials and systems

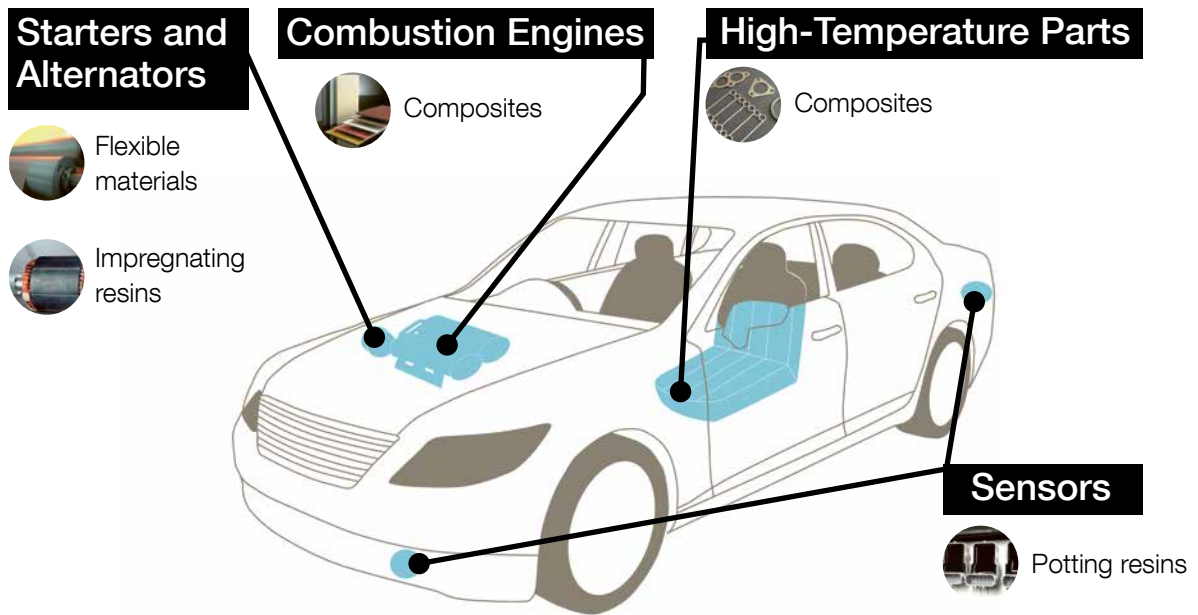
As the trend toward megacities continues to prevail in the coming years, mobility and emobility will be a major global issue. More people means more movement, greater mobility and a growing demand for transport solution.

Von Roll has extensive know-how in the energy and industrial markets and offers solutions for all vehicle types. Our experienced team of experts has been serving the automotive market for decades and supplies many interior parts to manufacturers of electric vehicles and vehicles with combustion engines.

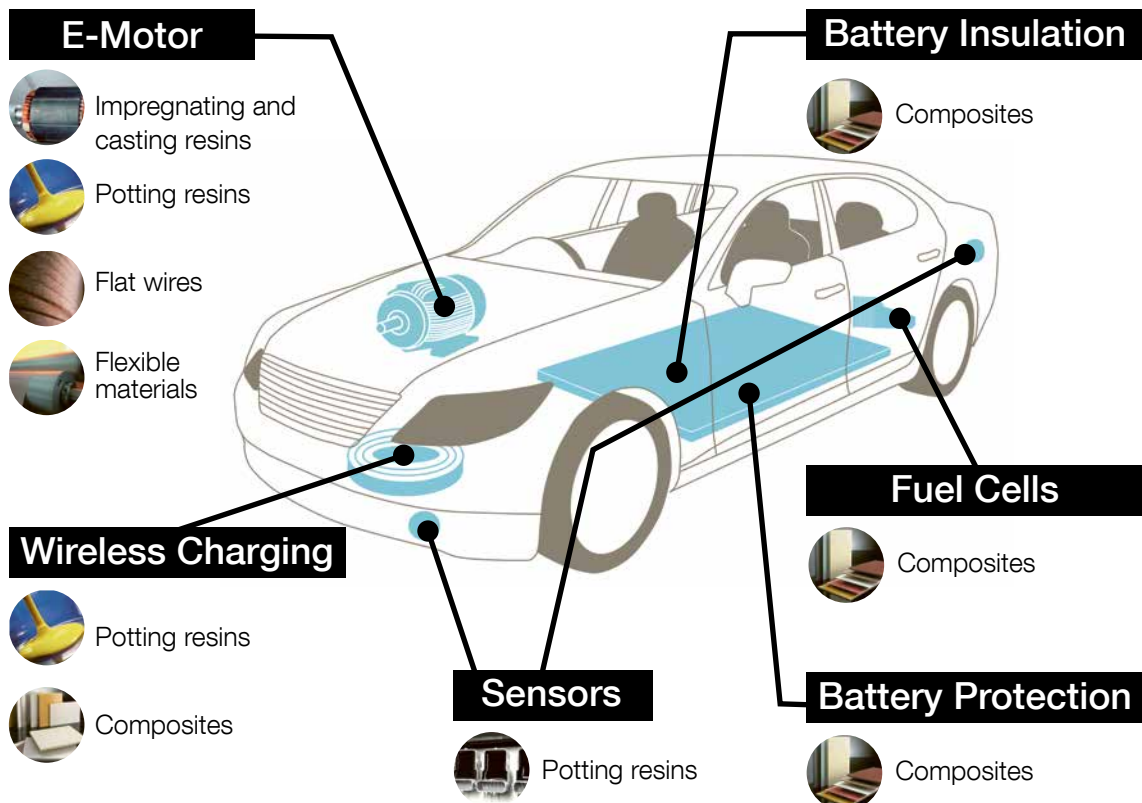
In view of the strong momentum, we founded Von Roll Automotive, a separate unit with a rapidly growing team, which focuses entirely on the needs of this market. An independent e-mobility lab was opened as part of the Von Roll Institute to develop tailor-made solutions for innovative electric drives.



Our Solutions for Cars with Combustion Engines



... and for Electric Vehicles



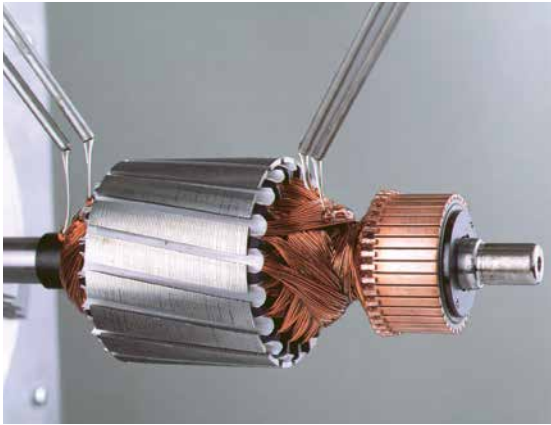
Solutions for Cars with Combustion Engines

Starters and Alternators

Von Roll offers different products for manufacturers of internal combustion engines, especially for starters and alternators. We have extensive experience with impregnating resins, flexible laminates and round wires designed to ensure the long-lasting functionality of these applications.

Impregnating resins

Our Damisol® and DOLPHON® product lines offer a wide choice of resins that are tailor-made for car alternators and starters and for your particular impregnation process.



An impregnation resin applied by trickling

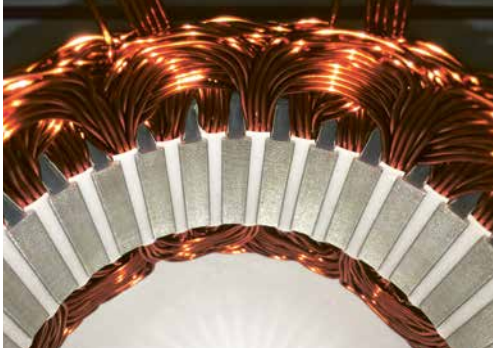


An impregnation resin applied by roll through

Product name	Chemistry	Diluents	Flash point (°C)	Viscosity at 25°C (cps)	Gel time @ 100°C (min)	Min. curing condition	Main characteristics
Resins							
DOLPHON® EX-88077	Solvent-free polyester	N/A	>120°C	500 – 700	6'	30'@ 145°C	Two components, high flash point, low emissions, suitable for starter impregnation
DOLPHON® XL-2162	Solvent-free polyester	N/A	>150°C	500 – 700	10'	30'@ 145°C	High-temperature-resistant green resin suitable for any stators or rotors for alternators
DOLPHON® XL-2102 OPT	Solvent-free polyester	N/A	>120°C	170 – 300	10'	30'@ 145°C	One component, highly stable, suitable for after-market alternator impregnation
DAMISOL® 3630 HTC	Solvent-free Polyesterimide	N/A	>120°C	3000 mPa.s	10'	60'@ 150°C	High-temperature-resistant green resin with improved thermal conductivity

Flexible laminates

Our Myoflex® product line provides slot insulation required for essential components in car motors. Myoflex® is available in combination with polyester film and non-woven polyester felt or combined with Nomex®¹ paper and polyester film or polyimide film.



Myoflex® used as slot insulation for a starter



Myoflex® delivered as biplex or triplex laminate

Product name	Construction	Product structure mil	Total thickness mm	Total weight g/m ²	Tensile strength		Break-down voltage kV	Thermal class °C	Main characteristics
					DM N/cm	MD N/cm			
Myoflex® NHN	Nomex calendered	3/3/3	0.25	275	>220	>140	>15	220	Outstanding electrical insulation at elevated temperature up to 220°C, high mechanical resistance, designed for automatic insertion
Myoflex® NHN	Polyimide film/ Nomex calendered	3/7/3	0.35	410	>280	>230	>22	220	Outstanding electrical insulation at elevated temperature up to 220°C, high mechanical resistance, designed for automatic insertion
Myoflex® NMN	Nomex calendered	3/4/3	0.28	295	>280	>190	>14	155	High mechanical resistance, also suitable for motors operating at 180°C, listed in 180°C UL systems, designed for automatic insertion
Myoflex® NMN	Polyimide film/ Nomex calendered	3/7.5/3	0.36	421	>360	>300	>18	155	High mechanical resistance, also suitable for motors operating at 180°C, listed in 180°C UL systems, designed for automatic insertion
Myoflex® NMN	Nomex calendered	2/5/2	0.24	281	>220	>200	>16	155	High mechanical resistance, also suitable for motors operating at 180°C, listed in 180°C UL systems, designed for automatic insertion
Myoflex® NMN	Polyimide film/ Nomex calendered	2/10/2	0.37	456	>330	>300	>20	155	High mechanical resistance, also suitable for motors operating at 180°C, listed in 180°C UL systems, designed for automatic insertion
Myoflex® PVSH	Polyester felt	3/4/3	0.25	284	>220	>185	>11	180	Fully saturated, high thermal resistance 180°C, good mechanical resistance, designed for automatic insertion
Myoflex® PVSH	Polyester film/ Polyester felt	3/10/3	0.40	500	>350	>280	>18	180	Fully saturated, high thermal resistance 180°C, good mechanical resistance, designed for automatic insertion

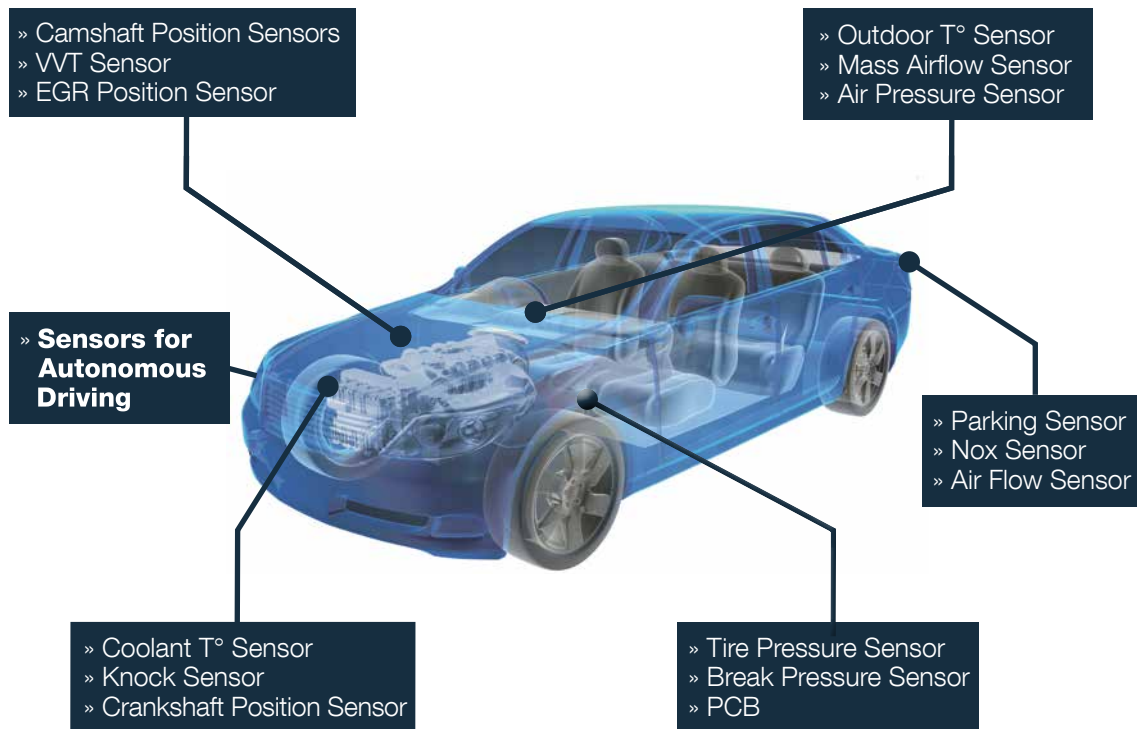
¹Nomex® is a registered trademark of DuPont®

Automotive Sensors

Resin Solutions for Automotive Sensors and PCBs

Our Von Roll and Dolph's® potting resin product lines are ideally suited to protect most sensors, including parking sensors, speed sensors, inductive sensors, sensors for autonomous driving, air pressure and air flow sensors, temperature and positioning sensors, tire pressure and break pressure sensors.

Von Roll provides cost-effective solutions for today's high-volume production runs. Click below to find a selection of typical resins for this market.



Outstanding properties:

- » Rigid to highly flexible resin solutions
- » Thermal shock resistance: Low glass transition temperature for safe usage from minus 60°C to +150°C
- » Thermal index up to 150°C
- » Flame-retardant UL V0
- » High oil and chemical resistance
- » Extremely low water absorption
- » Solder paste compatibility (Bono tests)
- » Compliant with new regulations and directives:
REACH, ELV, RoHS, halogen free-, MDI-free hardener available

Typical applications:

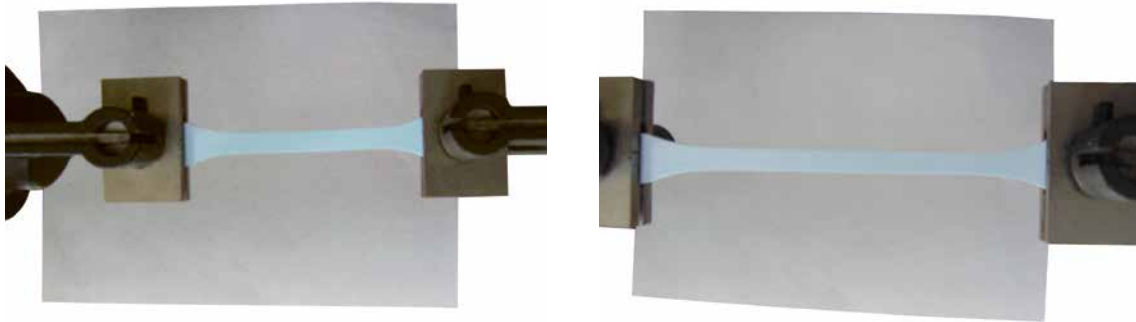
- » Electronic assemblies, PCBs
- » Fragile components
- » Sensors
- » Transformers, coils, relays

Brand	Reference*	Mix viscosity (mPa.s)	Hardness (Sh. A)	Tg °C (TMA)	Thermal expansion (ppm)	Thermal conductivity W/m.K	Elongation at break (%) 25°C
Dolph's	CB-1109	3500@25°C	40	-50	217	0.42	50 - 60
Damival™	13681	3300@25°C	51	-42	211	0.28	40 - 50
Damival™	13682	5000@25°C	46	-70	146	0.95	40 - 50

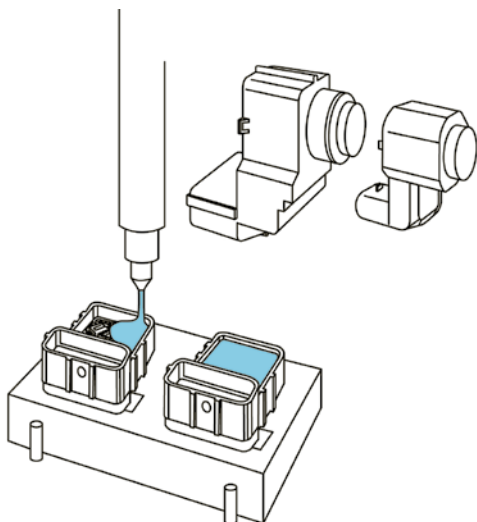
*Customization is possible on request

High elongation at break:

High flexibility and compatibility with fragile components.



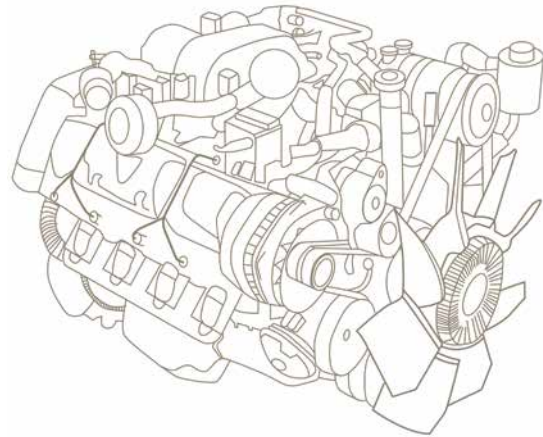
For more information on these products, please ask our experts.



Combustion Engines

Composite washers for sensors

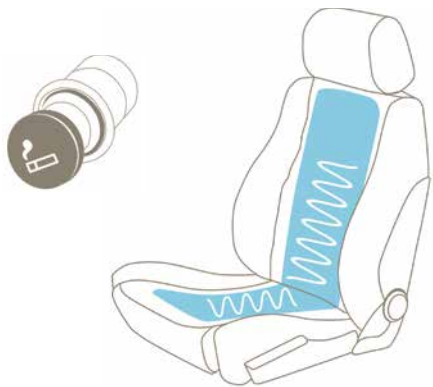
Our Vetronite® series offers you composite parts that are robust and temperature-resistant for solutions to the structural elements of automotive diesel engines.



A diesel engine with various components made of Vetronite®

High-Temperature Parts

Our thermal protection line offers you products from Deltherm®, Vetrotherm® to Miglasil® composites, which are easily machinable or moldable into a wide variety of shapes. Some of these products are primarily used in the automotive industry. A few of these applications require temperature resistance up to 1100°C.



High-temperature parts are used when temperature resistance is required



Deltherm®, Vetrotherm® to Miglasil® composites

Our Solutions for E-Mobility

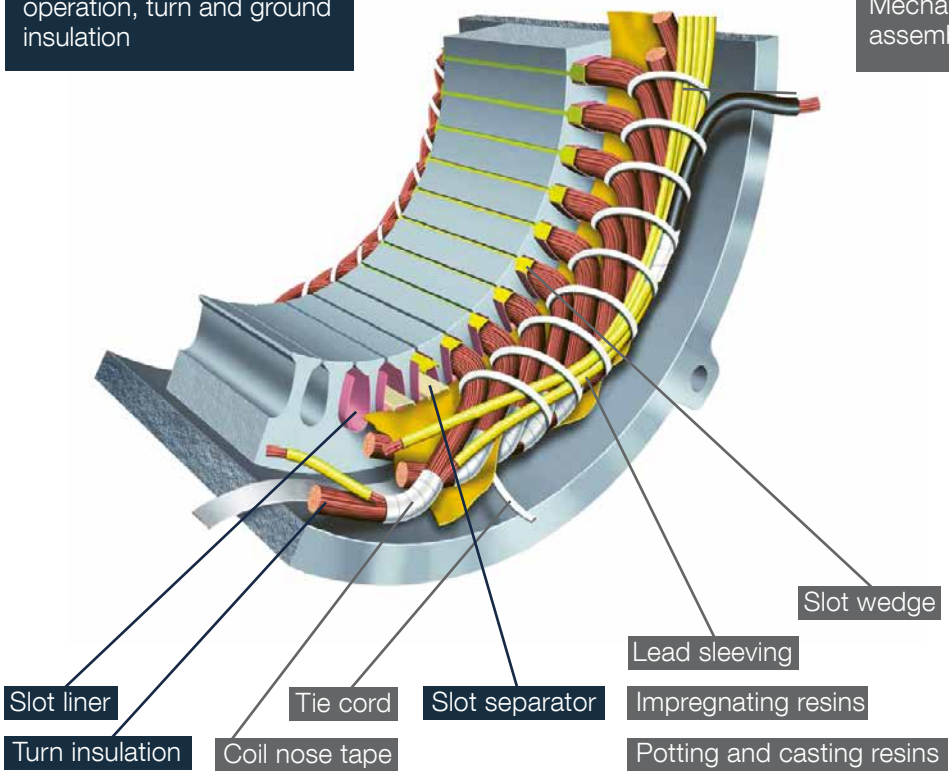
We serve the electromobility market by providing essential products for the core components of this technology. Our products are used in electric motors, lithium ion batteries, fuel cells and wireless charging systems.

Electric Motors

Von Roll offers different products tailor-made for hybrid cars and electric vehicle components. Our vast experience with impregnating resins, flexible laminates and wire conductors will ensure the long-lasting functionality of these essential components of electric cars.

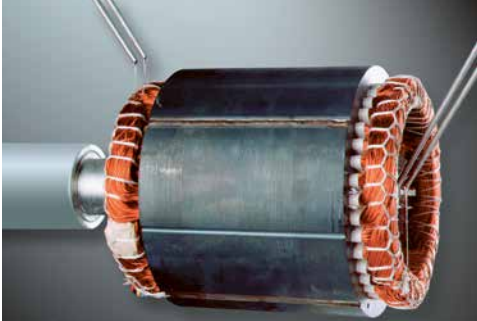
Primary/main insulation
Critical to safe and effective operation, turn and ground insulation

Secondary/minor insulation
Mechanical support, assembly aid



Impregnating and casting resins

Our resin range offers products free of VOCs (volatile organic components) with high thermal properties for harsh environments. They are suited for a variety of fast-curing processes, such as trickling, roll through and casting.



Available processes include trickling, roll through and casting



Stator with resin

Flexible laminates

Our Polyglas® tapes guarantee the fixation needed to keep your system mechanically robust with a lightweight, cost-effective solution.

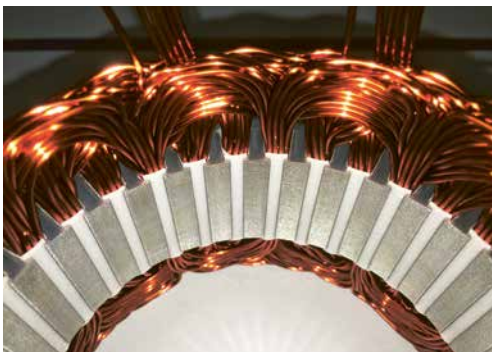


An electric motor component taped with Polyglas®



Polyglas® banding tape

Our Myoflex® product line provides slot insulation required for essential components in car motors. Myoflex® is available in combination with polyester film and non-woven polyester felt or combined with Nomex®¹ paper and polyester film or polyimide film.



Myoflex® used as slot insulation for a starter



Myoflex® delivered as biplex or triplex laminate

¹Nomex® is a registered trademark of DuPont®

Potting resins and composites

Our Von Roll Dolph's® and Damival® potting resins serve as a crucial element in safeguarding the wireless charging system by acting as a barrier between fragile wire components and external impacts like vibration, humidity and heat transfer. They can be used to fix cable ends as well as to protect the entire pickup or antenna coils.

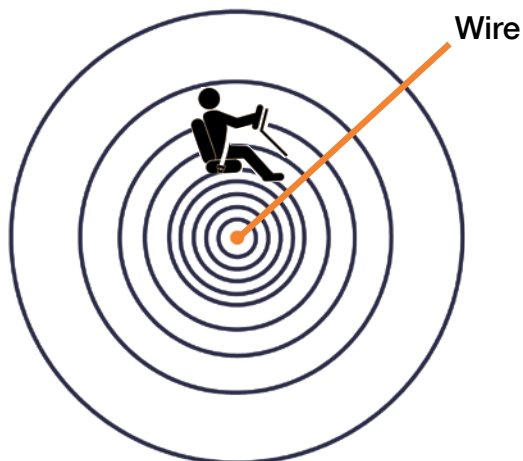


Damival® potting resin

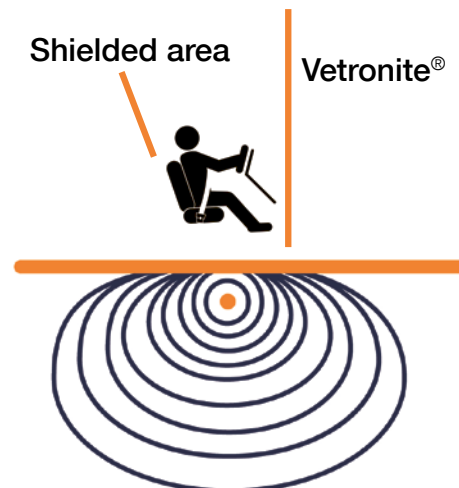


Vetronite® and other composites

Our Vetronite® composites are used to ensure the safety of driver and passenger as well as of electronic components against the electromagnetic field emitted by the wireless charging system. Our products are particularly designed to act as a cover to the pickup coil, and block the field from reaching to the upper part of the car.



Unshielded without Vetronite®



Shielded with Vetronite®

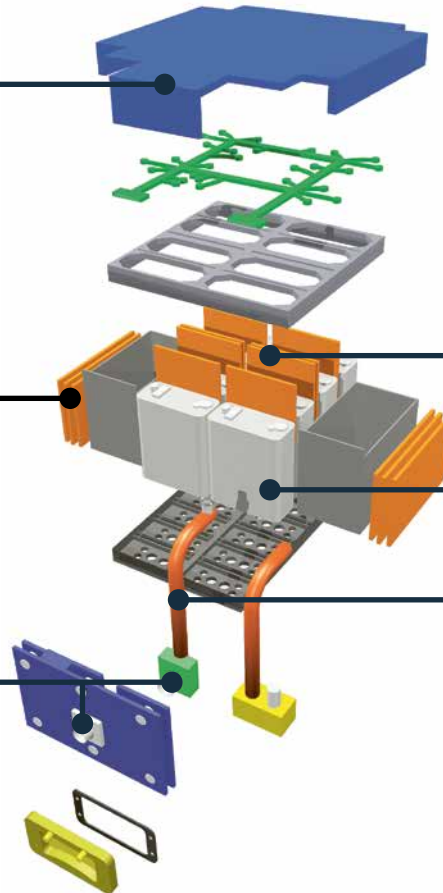
Battery Insulation and Protection

Von Roll offers various solutions for fire-resistant and crash-safe batteries for electric vehicles. Our Von Roll Shield product line ensures a high degree of safety both during operation and in case of a crash. Our products enable designs for automated manufacturing, and offer light-weight solutions for high reliability and more efficient battery systems.

Cover top insulation based on metal coated with **insulating varnishes**

Insulation with thermal and electrical properties – based on **mica laminates or other composite products**

Insulating composite tube based on mica or woven glass range



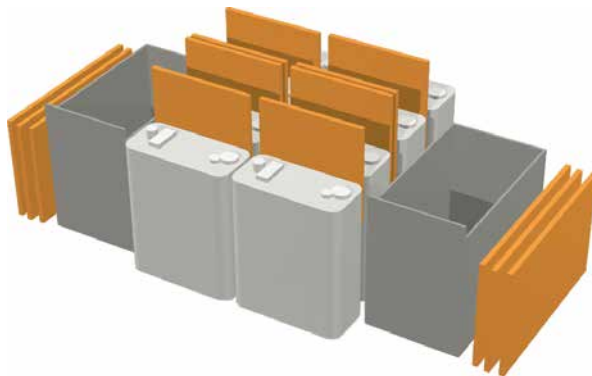
Spacers (separators) based on **mica laminates or other composite products**

Battery cell wrapped in **electrical and thermal insulation tape**

Busbar wrapped in **electrical and thermal insulation tape**

Battery insulation – Inside lithium-ion batteries

Von Roll Shield T not only insulates your system perfectly but also offers great performance at high temperatures:



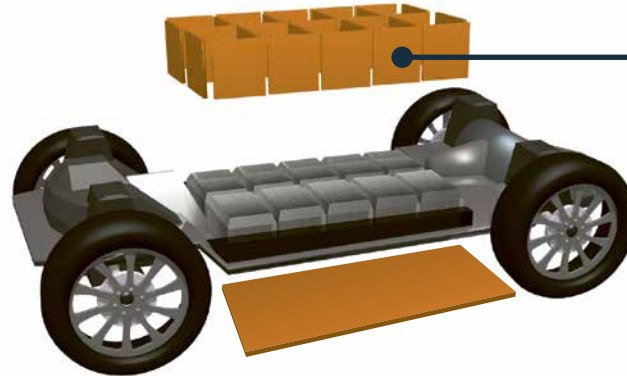
- » Thermal insulation (700°C and higher)
- » Low thermal conductivity
- » High dielectric strength
- » Electrical insulation
- » Chemical stability

Battery protection – Battery package

Von Roll Shield B protects your energy storage system from external mechanical threats:

- » Lightweight materials
- » Combination of materials possible
- » Different battery box designs
upon request

Reinforced battery housing
based on **composites**
for crash safety



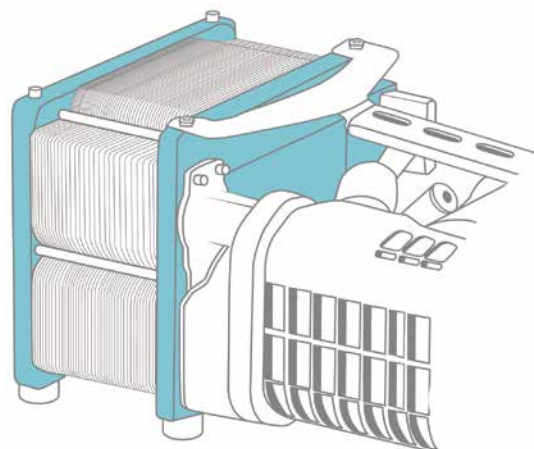
- » Mechanical strength: crash safety, prevention of thermal runaway/short circuits

Fuel Cells

Fuel cells for range extenders represent a cutting-edge technology for electric vehicles. This efficient technology is rapidly making its way into many applications. As a supplier of innovative solutions, Von Roll also supports this market with its composite products.

Our Vetronite products are used as structural parts in the fuel cell stack in fuel-cell-powered electric vehicles. Components made out of Vetronite retain their high mechanical strength at ambient temperature as well as high temperatures. They are also fire-resistant (we offer products that are classified V0 according to UL94).

In addition, Von Roll Shield T products are used as compressive seals for high-performance, efficient and planar fuel cells. These products support the thermal cycle stability required for this kind of application. Von Roll Shield T offers outstanding thermal and electrical insulation as well as moisture resistance.



We Enable Energy

Von Roll is the sole full-range supplier of materials and systems for the insulation of electrical machines as well as high-performance products for various high-tech industries.



Mica

All materials related to high-voltage insulation. Von Roll's commitment to mica starts with mining and ends with finished tapes.



Wires

Insulated round, flat and Litz wires for high-voltage, low-voltage and electronic applications.



Cables

Mica tapes for fire-resistant cables. Von Roll provides a wide range of products that are ideally suited to all commonly used standards.



Resins

Impregnation resins for high- and low-voltage, potting resins, casting resins, as well as encapsulating and conformal coatings.



Composites

Engineered materials made from a resin and a support structure with distinct physical, thermal and electrical properties. They can be molded, machined or semi-finished.



Flexibles

Insulating flexible materials for low-voltage applications such as flexible laminates.



Ballistic Protection

High-quality systems for armored defense based on thermoset / thermoplastic products in single-use or tailored combinations.



Testing

Von Roll provides electrical, thermal and mechanical testing of individual materials as well as complete insulating systems.



Training

Von Roll Corporate University provides a training program in high- and low-voltage insulation for its customers.

Please contact us or visit our website www.vonroll.com for further information:

Europe

Von Roll Schweiz AG

Passwangstrasse 20
4426 Breitenbach
Switzerland
P +41 61 785 5111
F +41 61 785 5188
cs.europe.mica@vonroll.com

Von Roll Deutschland GmbH

Theodor-Sachs-Str. 1
86199 Augsburg
Germany
P +49 821 9020
F +49 821 902 239
cs.europe.comp@vonroll.com

About Von Roll

We Enable Energy – As one of Switzerland's longest-established industrial companies, Von Roll focuses on products and systems for electrical power generation, transmission, storage and industrial applications. Von Roll's business portfolio is divided into the following businesses: **Von Roll Insulation** offers electrical insulation products, systems and services for generators, high- and low-voltage motors, transformers and other applications. **Von Roll Composites** produces composite materials and parts for a variety of industrial equipment.

Americas

Von Roll USA, Inc.

200 Von Roll Drive
Schenectady, NY 12306
USA
P +1 518-344-7100
F +1 518-344-7288
sales.us@vonroll.com

Von Roll do Brasil Ltda

Rua Vaticano, No. 179
06713-040, Jd. Fontana Cotia,
Sao Paulo
Brazil
P +55 11 4208 5995
F +55 11 4193 6789
cs.south.america@vonroll.com

Asia/Pacific

Von Roll Asia Pte Ltd.

6 Serangoon North Avenue 5 #03-01
Singapore 554910
Singapore
P +65 6556 4788
F +65 6556 4959
cs.asia@vonroll.com

Von Roll Shanghai Co., Ltd.

Unit C, No.1235, Minqiang Road
Songjiang District
Shanghai, 201612
China
P +86 21 6768 7020
F +86 21 5768 7891
cs.asia.china@vonroll.com