Automotive sealing solutions
Trelleborg Sealing Solutions is a leading provider of reliable sealing solutions for original equipment manufacturers (OEMs) and their suppliers. Collaborating closely with customers, local research and development teams worldwide, find innovative solutions to meet the challenges and demands of the automotive industry. We support our customers with a global network of competent and strategically placed manufacturing and logistics centers.
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Global Automotive Resources

- 6 Automotive Hubs
- IATF 16949
- 11 Manufacturing sites
- Zero Defect
- 9 Research & development centers
- 4 Logistics centers
- Damping Solutions

Contact us
You can find your local contact partners here:
www.tss.trelleborg.com/worldwide

Americas
- 3 Automotive Hubs
- 2 Manufacturing sites
- 1 R&D center
- 1 Logistics center
- Damping Solutions
Automotive Hub EU
Stuttgart, Germany
Czechowice, Poland
Stein am Rhein, Switzerland
Pernik, Bulgaria
Helsingør, Denmark
Kalmar, Sweden
Halfar, Malta

Automotive Hub IN
Bengaluru, India

Automotive Hub CN
Shanghai, China

Europe
1 Automotive Hub
7 Manufacturing sites
7 R&D centers
1 Logistics center
 Δ Damping Solutions

Asia
2 Automotive Hubs
2 Manufacturing sites
1 R&D center
2 Logistics centers
 Δ Damping Solutions

Project expertise
- Global resource management
- Steering committees including senior management
- Professional project planning tools
- Interdisciplinary teams
- Continuous customer communication
Solutions for the highest demands

- Braking system
- Thermal management
- Fuel lines
- Shock absorbers and chassis
- Sensors
- Steering
- Airbags
Chassis and steering
PTFE linear seals in the chassis optimize suspension comfort and intrusive noise.

Requirements:
- Low friction
- No stick-slip effect
- Wear resistance

Products:
- Turcon® PTFE seals:
  - Turcon® Twinseal
  - Turcon® Stepseal®
  - Back-up Rings

Fuel system
PTFE and FKM seals are in large-scale serial production for high-pressure applications.

Requirements:
- Temperature range: -40 °C to over +200 °C
- Pressures over 3000 bar
- Tested and approved compounds for all fuel blends
- Easy installation - snap-back effect

Products:
- Extreme low-temperature FKM O-Rings and molded components
- Developed with specialized high pressure testing equipment
- PTFE sealing rings

Sensors and safety systems
Multifunctional components combine, for instance, sealing and housing functions, reducing critical interfaces and lowering system costs.

Requirements:
- Fully automated manufacturing and inspection
- Cleanroom production
- Multiple functions in a small space

Products:
- Multicomponent parts
- Wide range of different material combinations:
  - LSR & PA66
  - Steel, PPA, EPDM

Braking system
Multicomponent parts and seal combinations made of PTFE and elastomer are solutions for the future of weight saving, performance, and above all, safety.

Requirements:
- Tested and resistant in all brake fluid
- Large number of OEM approvals
- Fully automated manufacturing and inspection
- Eliminate braking noise

Products:
- Multicomponent parts
  - LSR + plastic + metal
  - EPDM + plastic
  - Specialized PTFE seals/guides for reduced friction
Ready for the future

- Charging socket
- Power electronics
- eAxle
- Electric engine
- Battery case
- Thermal management
eMobility is booming, and it places high demands on components. When developing high-performance seals for eMobility applications, Trelleborg combines an effective R&D organization with modern digital processes to reduce lead times to the lowest possible for initial functional prototypes.
Trelleborg Sealing Solutions invests heavily in developing products for current and future challenges in the electric drivetrain.

**HiSpin®**

HiSpin® rotary seals deliver minimum frictional torque while offering a static and dynamic sealing function giving tight sealing regardless of the direction of rotation.

**HiSpin® PDR RT**
- Flexible for use in a wide temperature range from -200°C to +260°C with Turcon® materials
- Seals at top speeds of over 60m/s
- Shaft grounding with conductive PTFE
- Minimum frictional torque

**HiSpin® HS 40**
- Flexible for use in a wide temperature range from -45°C to +200°C with XLT FKM material
- Seal at top speeds of over 40m/s

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More range and better acoustics with our innovations

ElecMobility Powertrain

Scan the QR code to learn all about our HiSpin® family of products.
With our innovative products, in particular the Rubore® Radial Damper, vibrations can be eliminated where they evolve. Vehicle acoustics are improved significantly.

**Damping Solutions**

**Reduced frictional torque**
HiSpin® PDR RT / HiSpin® HS 40

**Improved acoustics**

**Housing seal**
- Automated assembly thanks to form stability
- Flexible design
- Large selection of materials
- Suitable for oil- and water-based coolants
- Elastomer or multicomponent solutions

**Rubore® Radial Damper**
- Damping of vibrations above 300Hz
- Designed to meet application requirements
- Large selection of materials
High-voltage batteries are the heart of eMobility, and they require special protection. By developing a variety of different concepts, Trelleborg can offer custom sealing solutions, regardless of the cover and battery housing geometry involved. These allow for inexpensive, fully automated assembly and simplified disassembly if the battery requires maintenance.

- Fully automated assembly possible
- Easy disassembly if maintenance is required
- Leak tightness in accordance with IPX9K & IPX7
- Flammability fulfilled in accordance with UL94 V0 & HB
- For aluminum, steel and plastic housings
- Specialized seal design allows for thin-wall covers and fewer screws

- Tolerance compensation between plastic and metal case
- 2C/3C solution for individual adjustment (R2M,R2P)
- Flammability fulfilled in accordance with UL94 V0 & HB
- Electrical insulation
Quieter while driving

Just like the radial damper, the cover damper acts at the point of origin, where vibration and noise are created. Our damping materials improve the acoustics of multiple vehicle components, and stand out for their unique design and low weight.

**Radial Cover Damper**
- Damping vibrations above 300Hz
- Designed to meet your requirements
- Large selection of materials

Heat production by power electronics

Direct liquid cooling is an innovative solution for high power densities and more compact modules. Trelleborg offers the perfect addition to your product. Our pressure-activated profile seal guarantees a reliable and efficient seal for your power electronics.

- Resistant to pressure peaks
- Narrow seal design enlarges the cooling surface and offers better performance
- Pressure-activated sealing profile
- Outstanding sealing for sealed edges

**Other applications:**
- O-Rings and molded components for coolant connections
- Seals for multi-way valves made of a PTFE and rubber composite
- Seal sets for electric coolant pumps

**Pressure-activated profile seal**
Material competence

Elastomers

Elastomers are one of the most important groups of materials for seals. When specified in line with requirements, they have outstanding elasticity and resistance properties. External influences such as media, oxygen, ozone, pressure and temperature need to be taken into consideration when choosing a material.

<table>
<thead>
<tr>
<th>Material</th>
<th>Typical media encountered</th>
<th>Example applications</th>
<th>Temperature*</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBR</td>
<td>Acrylonitrile butadiene rubber</td>
<td>Engine oil, hydraulic oil, greases</td>
<td>O-Rings as a pre-tension element for PTFE seals</td>
</tr>
<tr>
<td>EPDM</td>
<td>Ethylene propylene diene rubber</td>
<td>Brake fluid, cooling water, coolants</td>
<td>Seals in the coolant circuit, O-Rings for air conditioning and heating systems, brakes, housing seals for high voltage batteries</td>
</tr>
<tr>
<td>AEM</td>
<td>Ethylene acrylate rubber</td>
<td>Engine oil, transmission oil, AdBlue</td>
<td>Static seals in the engine, transmissions and eAxis, sealing the AdBlue injection valve</td>
</tr>
<tr>
<td>HNBR</td>
<td>Hydrogenated nitrile butadiene rubber</td>
<td>Oil, cooling water, coolants, AdBlue</td>
<td>Dynamic seals (RWD), actuators in the transmission, O-Rings for air conditioning and heating systems, and AdBlue injection valves</td>
</tr>
<tr>
<td>VMQ/LSR</td>
<td>Silicone rubber</td>
<td>Air, (cooling) water, (oil)</td>
<td>Sealing electronic components and plugs against ambient conditions</td>
</tr>
<tr>
<td>FVMQ</td>
<td>Fluorosilicon rubber</td>
<td>Fuel, CNG</td>
<td>Seals in the fuel system at low temperatures, CNG injection valve</td>
</tr>
<tr>
<td>FKM</td>
<td>Fluoroelastomers</td>
<td>Fuel</td>
<td>Seals throughout the fuel system, such as injection valves and lines</td>
</tr>
</tbody>
</table>

*Temperature ranges only apply in conjunction with media compatible with the Zurcon® materials in question.

Polyurethane

Zurcon® is brand name for Trelleborg’s polyurethane material range that includes unique and exclusive compounds developed and produced in-house. They have excellent elastic properties and wear resistance, combined with outstanding mechanical characteristics and a low compression set. Because of this, they offer multiple options for hydraulic and pneumatic sealing applications.

<table>
<thead>
<tr>
<th>Material</th>
<th>Special features</th>
<th>Example applications</th>
<th>Temperature*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zurcon® Z25</td>
<td>Specialized high-temperature PUR</td>
<td>Static and dynamic seals for hydraulic applications</td>
<td></td>
</tr>
<tr>
<td>Zurcon® Z13</td>
<td>60ShD PUR with outstanding chemical compatibility and a broad temperature range</td>
<td>Rubber-supported sealing solutions (pistons, rods, scrapers and rotary transmission) for hydraulic applications and high pressures and temperatures</td>
<td></td>
</tr>
<tr>
<td>Zurcon® Z22</td>
<td>Specialized low-temperature PUR that also covers a broad temperature range</td>
<td>Static and dynamic seal for gas (CNG, H2, etc.) and hydraulic applications</td>
<td></td>
</tr>
</tbody>
</table>

*Temperature ranges only apply in conjunction with media compatible with the Zurcon® materials in question.
PTFE

Turcon® and Turcite® are brand names for Trelleborg’s range of polytetrafluoroethylene materials. In general, PTFE offers the advantage of having a very low coefficient of friction. Our Turcon®- und Turcite® materials are developed by our R&D centers to specifically meet our customers’ unique demands, such as increasing extrusion stability, reducing wear and increasing thermal conductivity. The compounds listed below are just a small selection of the broad range of proprietary PTFE materials offered.

<table>
<thead>
<tr>
<th>Material</th>
<th>Special features</th>
<th>Example applications</th>
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</thead>
<tbody>
<tr>
<td>Turcon® M04</td>
<td>Medium fill level, high extrusion and wear resistance</td>
<td>Sealing ring for high-pressure injection valve, universal material</td>
</tr>
<tr>
<td>Turcon® X9218/X9214</td>
<td>Low fill level, with or without snap back properties</td>
<td>Sealing ring for high-pressure injection valve, special design for easy assembly and calibration</td>
</tr>
<tr>
<td>Turcon® X9616</td>
<td>Medium fill level, high extrusion and wear resistance, high thermal conductivity</td>
<td>Sealing ring for high-pressure injection valve, special design based on specific customer requirements</td>
</tr>
<tr>
<td>Turcon® M12</td>
<td>Low friction, high wear resistance</td>
<td>Universal material for hydraulic applications, such as shock absorbers, convertible roof systems, CO2 air conditioning systems</td>
</tr>
<tr>
<td>Turcon® MC2</td>
<td>Electrically conductive</td>
<td>eMobility, avoiding electric charge build-up and spark production</td>
</tr>
<tr>
<td>Turcon® QD1</td>
<td>Self-lubricating for very low friction</td>
<td>eMobility, used for HiSpin® rotary seals for extremely high speeds</td>
</tr>
<tr>
<td>Turcite® T47</td>
<td>Low friction, high wear resistance</td>
<td>Universal material for bearings and Slydring®</td>
</tr>
<tr>
<td>Turcite® T51</td>
<td>Very high extrusion resistance</td>
<td>Bearings and Slydring®</td>
</tr>
</tbody>
</table>

Unique electrically conductive

Turcon® MC1 and Turcon® MC2 – specially developed PTFE materials combine high conductivity with very good sealing properties.

Quick changes by an IGBT frequency converter can result in electric discharge machining bearing current. The fault occurs in the form of a flashover, once the charge built up in the bearing exceeds the breakdown voltage of the lubricant. Turcon® MC1 and Turcon® MC2 take over the shaft grounding function in electric engines. This allows them to prevent corrugation damage and craters on the bearing, significantly increasing the service life of the electric engine.

Advantages:
- HiSpin® 2-in-1 solution: dynamic sealing function and shaft grounding
- Reduces the number of components
- Easier assembly
- Potential cost reduction
Challenges posed by the automotive industry include reducing assembly times, cost and weight. The answer is the innovative production process used for multicomponent parts. **Thermoplastics and elastomers combine function and seal in one component.**

**Advantages:**
- No reworking required
- Good process repeatability with cavitation-optimized material consumption
- New design flexibility
- Chemical bonding without adhesives
- No mechanical interlocking required
- Complete production process in one cell
- Various material combinations possible
- Inline manufacturing and inspection
- Reduction of individual parts
ServicePLUS

While you concentrate on your core business, we ensure all your requirements are covered throughout the value chain.

Learn more about ServicePLUS
Scan the QR code to view the video
http://tss-seals.trelleborg.com/web/service-plus

Some examples of services we offer

**Engineering**

**Product expertise:** An ideal product requires the right compound and an optimized geometry. Our customer-specific designs fulfill these requirements in consideration of the manufacturing process in use.

**Project expertise:** Agility is becoming more and more important. We achieve this through efficient collaboration of interdisciplinary teams. This allows us to deliver reliable information for our customers with short reaction times.

**Digital support:** Internet of Things (IoT) – Integrated sensors collect data on wear and performance capabilities of sealing solutions. Digital Twins – Digital mapping of the real application to better assess the behavior of sealing solutions.

**Enhanced Supply Chain**

**Laser marking:** Laser technology can be used to mark components and allow them to be traced.

**Manufacturing**

**Surface treatment and coating:** Seal-Glide®: Our unique surface treatment reduces friction and prevents seals from sticking together, allowing for more efficient assembly.

**Innovative manufacturing technologies:** We can use our different 3D printing processes to quickly produce prototypes and design samples.

**Assembly analysis:** Joint analysis of assembly processes with the customer facilitates more efficient process steps that ensure quality.

**Aftermarket**

**Packaging solutions:** We are prepared to package products as a sealing kit for your replacement parts market, based on your company layout. It is easy to add installation instructions, for instance, for added value.
Evolving Electric

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eMobility@trelleborg.com
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Versatile CAD service
Convenient online access to our drawings in 2D and 3D - in all common CAD formats.

Useful apps for automotive applications

O-Ring Selector
O-Ring and housing dimensions in millimeters or inches.

ISO fits and tolerances
Offers results based on DIN ISO 286 systems for tolerances and fits.

Universal Converter
Large range of technical and scientific units for any dimension. Select the appropriate material overview table for hardness conversion. Enter a value to convert it into another hardness scale.

Sealing Materials Selector
Enter the material specifications in combination with your required parameters, such as temperature or hardness and the app will immediately suggest suitable materials to meet your needs.

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Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Its innovative solutions accelerate performance for customers in a sustainable way.

Trelleborg Sealing Solutions is a leading developer, manufacturer and supplier of precision seals, bearings and custom-molded polymer components. It focuses on meeting the most demanding needs of aerospace, automotive and general industrial customers with innovative solutions.

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