in the groove
The world of seals and service

Trelleborg Sealing Solutions

Automotive

Shake, Rattle and Roll
Robust sealing for off-road shock absorbers

New Technology

A coat of many colors
Making seal segregation easy during assembly
Shake, Rattle and Roll

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Automotive

Keeping Stride

Allowing patients to have a natural gait, the new prosthetic knee from Freedom Innovations is industry-leading.
Six Sigma in Malta

Trelleborg Sealing Solutions Malta has embarked upon a Six Sigma improvement program working together with Trelleborg Sealing Solutions Germany and Bosch. Its aim is to cross-fertilize ideas with one of Trelleborg Sealing Solutions Malta’s major automotive customers to potentially improve inspection efficiency within the Fuel Injectors Business Unit.

Offshore Technology Conference 2008, Houston, TX USA

Once again, Trelleborg Sealing Solutions co-exhibited with Trelleborg Engineered Systems at OTC 2008 in May, an event that is considered to be the world’s largest offshore exhibition. This year’s attendance reached 75,092, a 26-year high and an 11 percent increase over 2007. Held at Reliant Park in Houston, the show hosted professionals from 2,500 companies spanning 110 different countries.

Teaching seals in Japan

Trelleborg Sealing Solutions Japan has developed a training course on seal technology called the “Seal Academy”. It is made up of three parts: basic, intermediary and advanced. 22 participants from 11 companies participated in the first training session which took place in Tokyo during May. Hiroshi Shimizu, Technical Planning Manager, who was presenting says, “Even though it was a long, full day seminar, every single attendant seemed to keep their attention until evening. The people attending the course appeared to really value the opportunity of learning about sealing technologies through real-life case studies.”

Exhibiting in Algeria

Trelleborg Sealing Solutions took part for the 4th consecutive time in the FIA - Foire Internationale d’Alger. This is the most important industrial exhibition in Algeria with more than 800 companies coming from 34 countries attending the 41st event. The exhibition was run by Sarl Hydromecanique who have represented Trelleborg Sealing Solutions in Algeria since 2004.

FEA global focus

Finite Element Analysis (FEA), used to calculate load and deformation of seals, is a key tool used by Trelleborg Sealing Solutions. In order to build on and enhance our FEA capabilities, the second Global FEA conference was recently organized. Experts met together to discuss ways to further improve support. Topics included sharing of FEA knowledge between different R&D locations, internal cooperation between sites and future FEA development.
On show worldwide

Trelleborg Sealing Solutions is exhibiting at lots of major venues globally, why not come and see us at one of these upcoming events.

15 to 19 September
Brno, Czech Republic
50th International Engineering Fair - MSV 2008
The largest technology trade fair in central Europe with over 2,000 exhibiting companies, including over 800 foreign exhibitors

29 to 30 October
Paris, France
Aero-Engine Expo 2008
A meeting place for aero engine professionals from all stages in the aero engine life cycle

22 to 24 September
Las Vegas, Nevada
MINExpo
Happening once every four years, this exhibition aims to move companies to a new level of performance in the highly competitive worldwide mining industry.

7 to 8 October
Stuttgart, Germany
15th ISC - International Sealing Conference
The aim of this conference is to allow people involved in sealing technology to share the results of scientific research and development along with the experiences of users.

20 to 24 October
Barcelona, Spain
Expoquimia International Chemical Industry Exhibition
This key event presents solutions, products and innovation related to all disciplines within the field of chemistry.

Find out more information about these events under Service/Fairs at

www.tss.trelleborg.com
26 to 29 August  
Stavanger, Norway  
ONS 2008  
One of the world’s leading arenas for the energy business

22 to 25 October  
Gyunggi-do, Kintex, Korea  
KOAA Show Korea 2008  
This exhibition focuses on the Korean automotive parts and other related industries.

9 to 13 October  
Beijing, China  
CIMES 2008  
Here the entire range of products and services for metalworking will be on display with special emphasis on metal cutting machinery, forming machinery, mold processing machinery and much more.

9 to 11 September  
Taipei, Taiwan  
SEMICON Taiwan 2008  
A preferred event in this region for buyers to see and compare semiconductor equipment from all over the world

29 September to 4 October  
Plovdiv, Bulgaria  
Plovdiv International Technical Fair  
An International Technical Fair that exhibits the latest developments of world leaders in a wide variety of industries

20 to 22 October  
Mumbai, India  
India Chem 2008  
Aiming to promote and accelerate the growth of the pharmaceutical and petrochemical sector within India.
Launching the Zurcon® Scraper DA24 Venting Version double-acting scraper. Especially for severe operating conditions, its unique venting design incorporates pressure relief valves to prevent system failure.

**Advanced scraping capabilities in severe operating environments**

The double-acting scraper DA24 in Zurcon® thermoplastic polyurethane has proven effective in applications with severe operating conditions for many years, especially in environments where there is a high level of external contamination and dirt.

In some situations when there is pressure build-up behind the scraper, the scraper can be pushed out of the groove causing total sealing system failure. Based on DA24, Zurcon® Scraper DA24 Venting Version has axial holes through the section which operate as pressure relief valves, allowing oil to be released in the case of overpressure.

With improved stability in the groove the Zurcon® Scraper DA24 Venting Version becomes one of the most efficient scrapers available on the market.

**Method of operation**

Axial holes through the section of the Zurcon® Scraper DA24 Venting Version operate as pressure relief valves, allowing oil to be released in the case of overpressure. This prevents the scraper being pushed out of the groove when there is pressure build-up.
Launching Zurcon® Scraper DA24 Venting Version

Benefits of Zurcon® Scraper DA24 Venting Version

- Excellent scraping performance
- Superior protection against ingress of dirt, external media and moisture
- Efficient sealing behavior
- Advanced friction characteristics
- Limited heat generation, extending service life
- Stability in the groove securing function

In short...

- Launching Zurcon® Scraper DA24 Venting Version
- Engineered for severe operating conditions
- Pressure relief valves prevent system failure
- One of the most efficient scrapers on the market
Zurcon® Scraper DA24 Venting Version: a scraper with unique features

Zurcon® Scraper DA24 Venting Version is a double-acting thermoplastic polyurethane scraper where axial holes through the section operate as pressure relief valves, allowing oil to be released in the case of overpressure.

Pressure relief through axial holes

Positioned above the external scraping lip, the holes allow oil to be released when there is pressure build-up on the inner lip by temporarily activating the outer lip.

Maintenance indicator

Release of oil often indicates the end of life for the sealing system and the necessity for preventive maintenance.

Trimmed inner sealing and scraping lip

Provides optimum contact pressure for efficient sealing and wiping of residual oil film.

Robust outer scraper lip

Supported by a housing recess, it ensures a high contact force on the rod, preventing penetration of moisture, dirt and impurities even when radial deflections of the rod occur.
For more information on Zurcon® Scraper DA24, visit tss.trelleborg.com

To download the catalog, go to the Download Area.

**Facts**

**Zurcon®:**

For extended life

DA24 Venting Version is produced in Zurcon®, the Trelleborg Sealing Solutions proprietary thermoplastic polyurethane material specially developed for sealing applications. This provides long service life under harsh working conditions and resistance against installation damage.
Seals from Trelleborg Sealing Solutions are contributing to the performance of the Airbus A400M, Europe’s new transporter aircraft.

To find out more about sealing solutions for the Aerospace industry, visit

www.tss.trelleborg.com
Around forty years ago, the first Transall was produced. Now its successor as European transporter aircraft, the Airbus A400M, is due for delivery. Its payload is double that of its predecessor, flying range is four-times longer at 9,250 kilometers/ 5,750 miles and speed has increased from 513 kilometers/ 320 miles per hour to 900 kilometers/ 560 miles per hour.

Flexible sealing on the aircraft cowling

The A400M has to tackle difficult conditions ranging from artic cold to the heat and storms of the desert. In these circumstances, snow and sand particles must be prevented from entering the engine head and cowling of the air intake. This cowling expands and shrinks due to strong thermal fluctuations and dynamic stress, so seals for it must be very flexible. Airframe seals have therefore been specified for this application.

Bonded to metal on the gearbox flap

A custom-designed Turcon® PDR seal is used on the flap of the gearbox of the A400M. Bonded to a metal frame is a primary seal in nitrile butadiene rubber (NBR). This is combined with an integral Turcon® PTFE based environmental sealing element. The NBR sealing element is spring-energized to ensure permanent elasticity and sealing force, while the Turcon® element has excellent friction characteristics and resistance to aggressive media including the hydraulic lubricant Skydrol. Providing high reliability, it operates in temperatures from -60°C/-76°F up to +250°C/482°F while retaining their form and pressure resistance.

Airframe seals

Airframe seals are hand-fabricated to standard or custom profiles with absolute attention to detail and quality assured through 100 percent inspection. Focusing on aerodynamic efficiency, they offer reliability in service, along with efficiency in assembly and maintenance. The optimum seal to fit the design window is developed using advanced Finite Element Analysis (FEA) combined with product qualification programs, including extensive testing and verification. These seals will remain flexible at extreme temperatures from -60°C/-76°F up to +250°C/482°F while retaining their form and pressure resistance.
Hydraulic systems used in tile making equipment require seals that are strong and wear-resistant to be able to handle pressure and temperature.

Ceramic tiles have been produced in the city of Foshan in Guangdong Province, China, for thousands of years, but the process has inevitably undergone huge changes since those first handmade examples.

Today’s tiles are mass-produced by machines that can measure up to 10 m/33 ft high and 4 m/13 ft wide, exerting a force of thousands of tons. Pistons and hydraulics systems lay at the heart of this equipment, and Trelleborg Sealing Solutions provides the seals that ensure their smooth, efficient operation for hours on end, all year round.

Seals are critical components in tile making equipment

“Our seals are critical components for these machines,” says Elton He, Application Engineer with Trelleborg Sealing Solutions in southern China. “We supply all the seals used in the cylinders, and since these provide the power used to press the tiles, they are of crucial importance to the functioning of these machines.”

Tiles are produced by pressing a powder consisting mainly of clay and feldspar into a mold using a piston. Then, another piston pushes the tiles out of the mold and away for drying, glazing and firing in a kiln.

Today, Trelleborg Sealing Solutions provides the seals for a large proportion of the ceramic presses built in China and supplies all of China’s main ceramic press manufacturers. The largest of these is Foshan Henglitai Machinery (HLT), which was established in 1957 and produced China’s first hydraulic ceramic press in 1988. The company currently has the largest market share and exports to numerous countries.

Continuously withstanding very tough operating conditions

HLT’s biggest ceramic press exerts a maximum pressing force of 72,000 kN and contains between 100 and 150 Trelleborg Sealing Solutions seals, ranging in size from just 50 mm/2 inches to 1.6 m/5 feet 3 inches. These include many high-performance Turcon® based PTFE seals – engineered thermoplastic compounds that offer very low friction to reduce power loss and minimize wear over a long life. Orkot® wear rings are also used, which are composite bearing materials that incorporate advanced polymer technologies.

High-tech materials such as these are crucial for the demanding conditions under which they must perform. “Most of the cylinders move at a rate of about ten or 15 cycles per minute and the machines normally operate about 20 hours a day,” says Elton He. “They might only be shut down at the end of the year to perform maintenance, so these are very tough operating conditions.”
Piston seals, such as those installed on the groove of the pistons that press the actual tiles. Turcon® seals, such as patented Glyd Ring® T, Stepseal® 2K and Excluder®. Orkot® and Turcite® Wear Rings. Large-diameter O-Rings, which function as static seals on all the cylinders and flanges in the ceramic press.

There are 100-plus seals from Trelleborg Sealing Solutions in each of Chinese ceramic manufacturer Foshan Henglitai Machinery’s ceramic presses. These can be divided into four basic types:

- The seals have to be durable – sealing in the mineral oil-based hydraulic oil – as well as strong, wear-resistant and capable of handling pressures up to 35 MPa/5,075 psi and withstanding temperatures in the range of 60°C to 80°C/140°F to 176°F.
The original O-Ring calculator was launched in 2005. It has been updated inline with designers’ needs. The latest version allows inch calculations.
Since its launch in 2005, the Trelleborg Sealing Solutions online O-Ring calculator has been universally accepted by engineers. As we launch its latest update, which gives inch calculations, we talk to the man behind the program, Bernd Murthum, O-Ring Product Manager.

"The idea behind the O-Ring calculation software was to make things simple," says Bernd. "From talking to engineers and designers who regularly use the tool, we have undoubtedly achieved that objective. Other programs existed in the market, and our first version matched up with them, but with two major updates since, I really think that we have moved ahead."

"Calculating both metric and inch measurements"

The latest edition of the O-Ring calculator gives users the capability of calculating both metric and inch measurements.

"This is important not only for US-based engineers but globally where design is initiated from America," continues Bernd. "This was a much needed development according to feedback from our users. Other enhancements have been the addition of parameters for perfluoroelastomers (FFKM). These materials behave very differently to other elastomers so that proved very challenging. We have also responded to requests for clearer warning messages, for operating temperatures, to take into account cross section changes and the inclusion of thermal expansion coefficients as preset values that can be overwritten."

"It's the best free-of-charge tool of its kind"

When asked if there are any future developments planned, Bernd Murthum says, "I think there is little more that can be done technically. In my opinion, it's the best free-of-charge tool of its kind available. I guess our next focus is to make the software multilingual, a Chinese version would be great."
Features of the O-Ring Calculator include:

- Inch and metric sizes
- Sizing capability
- Design parameter recommendations
- Complete measurements
- Recommendations for a broad range of materials including perfluoroelastomers
- Warning messages when there are input errors or deviations from design recommendations
- Results and comments may be printed, saved online or filed as a PDF
The O-Ring Calculator is available free-of-charge for online use, via the Trelleborg Sealing Solutions website, www.tss.trelleborg.com. Access it through the registration area along with other enhanced services including our electronic catalog and versatile CAD service.
As a pioneer in the muscle car industry, Edelbrock Corporation maintains a solid reputation for producing quality performance parts. So when its off-road shock absorbers began to fail in field tests and customer use, it wasted no time in calling Trelleborg Sealing Solutions.

In short...

- Edelbrock Corp. produces off-road shock absorbers
- Side load caused seals in these to fail
- Trelleborg Sealing Solutions collaborated on an alternative
- Field failures are now virtually zero
Shake, Rattle and Roll

Larry Monahan, Plant Manager for Edelbrock Corporation, and Sergio Murcia, Senior Sales Engineer at Trelleborg Sealing Solutions West, sat down with in the groove to talk about this application.

The Problem

In the groove: Why were the shock absorbers failing?

Larry Monahan: Edelbrock designed its after-market shock absorbers for on-road travel, where the shock absorber moves up and down, absorbing the impact of wheels on the road surface. The original design worked well for street performance. But when customer demand brought Edelbrock into the off-road market, the shock absorbers had much more side-to-side movement. The resulting side-load issue caused the seals to fail, and shock oil went everywhere.
In the groove: How did this affect your customers?

Larry Monahan: Our end-users are owners of lifted off-road trucks, typically they will be someone who wants to throw a tent in the back of a Jeep and spend the weekend in the desert. These off-road enthusiasts buy lift kits and completely upgrade the suspension system. They expect a particular level of performance. No one wants to get out in the middle of the desert to have the shocks fail. But with the shock absorbers designed for street performance, this was a real possibility. In field tests, we blew up one set of shocks in 20 minutes. That’s unacceptable.

The Solution

In the groove: This project involved a great deal of collaboration between engineers from both companies. How did you partner in the design process?

Sergio Murcia: The engineers at Edelbrock gave us the general idea of what they envisioned—a single component that would integrate several critical pieces of the shock absorber. They provided us with the overall external specifications of the seal gland. Based on this and on the envelope of hardware dimensions, our engineers went to work to design a one-piece element that would ultimately integrate six components: the rod seal gland, the bushing, the primary seal (Stepseal®), the wiper, a custom molded extension cushion and the static seal (an O-Ring).

In the groove: Did you continue the collaboration in the testing phase?

Sergio Murcia: Yes. The Edelbrock engineers facilitated the process by being willing to test our products at various states of its development in their laboratory as well as in the field. We went through several rounds of testing and design iterations until ultimately achieving the set goals in performance, form, fit and function. Their expert input was instrumental throughout the process.

In the groove: How does this integration improve the off-road shock absorber?
Edelbrock Corporation

Became a pioneer in the automotive performance industry in the 1940s under the leadership of Vic Edelbrock, Sr.

Specializes in such aftermarket parts as carburetors, cylinder heads and intake manifolds for muscle cars and off-road vehicles.

Operates in six locations, including one of the most modern high-tech green sand aluminum foundries in the Western United States.

Headquarters in Torrance, CA includes research & development, manufacturing and technical support.

Exhaust and Suspension Division designs and manufactures high-quality components using custom-built equipment and state-of-the-art testing facilities.

2008 marks Edelbrock’s 70th year as one of America’s leading high-performance aftermarket manufacturers.
Larry Monahan: The new seal has solved the side-load issue. Our field failures are virtually zero. We’ve done extensive testing on our vehicles and haven’t had one fail.

The Value

*In the groove*: How has the integrated design affected your market?

Larry Monahan: We sell our shock absorber to two different markets. The first is off-road companies who specialize in lift kits. We design non-branded shock absorbers with specific lengths for each individual kit. We specialize in smaller runs and fill a very specific niche in the market. These customers are more than satisfied with the new one-piece seal assembly.

The second market is the general public, who can buy our branded, application-specific shock absorbers at any number of distributors. The integrated one-piece seal assembly works so well that we plan to phase out the old model and sell the new shock absorber in both markets.

*In the groove*: What about the overall value to Edelbrock Corporation?

Larry Monahan: The integrated one-piece seal assembly replaced six part numbers supplied by three different vendors. These parts needed several sub-assemblies prior to installation in the shock absorber. Now, we order one part number, and Trelleborg Sealing Solutions assembles it for us, saving us one minute of assembly time for each shock absorber. By itself, the integrated one-piece seal assembly is a more expensive product, but because of the labor savings and diminished returns, it’s cheaper for us to use this than the old style. More importantly, it gives us more confidence in the product we’re sending out.

The Future

The integrated rod seal gland assembly might be the first project Larry Monahan has worked on with Trelleborg Sealing Solutions in his first two years as plant manager at the Shock/Russell division of Edelbrock, but it won’t be the last. “We’re already working on future applications,” he says.

**Muscle car**

Muscle car is a term used to refer to a variety of high-performance automobiles, generally American and Australian. These cars were usually two-door, rear wheel drive mid-sized cars with large, powerful V8 engines.

Classic muscle cars came out in the late 1960s and early 1970s, and they were built for street use and drag racing. These include the Dodge Dart, Ford Thunderbolt, Buick Skylark Gran Sport, Dodge Coronet, Chevrolet Chevelle, Ford Torino Cobra, Plymouth Road Runner and Pontiac GTO.
4 x 4 industry

Four-wheel drive vehicles and off-roading as a recreational activity became popular in the United States after World War II, when a large number of light off-road military vehicles (like Jeeps) became available to the public.

Extra ground clearance, sturdy tires, and front and rear locking differentials are a must for this sport. While most auto manufacturers produce some sort of off-road vehicle, many sport enthusiasts modify their trucks and sport utility vehicles (SUVs) with after-market lift and suspension kits to enhance their vehicles' performance on rough terrain.

Examples of off-roading as a sport include mudding, dune bashing and rock crawling. In each, participants drive their vehicles over muddy, sandy or rocky terrain to test their navigation skills and vehicle durability.
Trelleborg Sealing Solutions launches a range of colored coatings for O-Rings. Based on superior coating technology, these surface treatments are ultra-thin and resistant to cracking and peeling. Allowing segregation of similar seals, they demonstrate almost the same properties as comparable clear coatings, facilitating both push-fit and automated assembly.

**In short...**
- Launching colored coatings for O-Rings
- Ideal for segregating seals in production facilities
- Ultra-thin, they resist cracking and peeling
- Improve friction characteristics of elastomer O-Rings
Trelleborg Sealing Solutions provides a wide range of readily available colored coatings, including turquoise, pink, brown, green, white, blue, yellow, orange and red. The surface treatments can be applied to most seals, standard or custom, in the majority of elastomer compounds.
New Technology

As O-Ring materials are usually black, one seal may appear almost identical to another, but can vary slightly in dimension or be of different compounds. A large number of O-Rings may be used in one assembly. This is especially the case in automotive component manufacture, and installing a seal in the incorrect location can cause leakage or even seal failure.

Color perception

Rods and cones. Hue and saturation. Shade and tint. All play a key role in color perception. But there’s more to color than what meets the eye.

Color has emotional, physical and psychological effects on us as well. It has the power to increase our heart rate, affect our mood and even influence purchasing decisions.

Today, color is big business. Corporations spend billions of dollars each year in color market research. Some say red communicates danger or risk, white conveys innocence and purity and blue represents trust. From the latest trends in kitchen remodels to the hottest selling cars, one thing is sure. Color matters.

Improved friction characteristics make assembly easier

Like clear coatings, the colored coatings improve the friction characteristics of elastomer O-Rings. Dependent on the surface treatment, they can make once only push-fit assembly easier or facilitate automated assembly, preventing the O-Rings sticking together during this process.

Color-coding is one of the best ways of segregating seals

An effective and easy means of segregation within a production facility is therefore critical to ensure there are no mix-ups, and color-coding is one of the best ways of segregating O-Rings. In addition, as lighter colors can be more easily detected within a black or dark assembly, they can also aid end-of-line quality checking.

The widest range of colored coatings available as standard from one seal supplier

“Trelleborg Sealing Solutions offers what we believe is the widest range of colored coatings available as standard from one seal supplier,” says Simone Frick, Product Engineer for O-Rings. “Much research has been involved in the development of these surface treatments. Ultra-thin, they have no negative effect on the performance of the elastomer O-Ring and have the benefit of enhancing friction characteristics. Offering superior resistance against cracking, unlike some competitive products, they are virtually impossible to peel from their substrate.”

Colored coatings can be applied to a variety of different seal profiles.

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From the original seal to the coated solution

The Process flow

Depending on the coating or surface treatment, the seals will pass through different production steps. For Handling Aids these include control, packaging and labeling.

To ensure a high quality result, the micro-thin coatings of the Assembly and Application Professionals are applied in a numerically controlled process. This has two additional cleaning stages followed by plasma activation, which guarantees a firm and permanent surface bond for the elastic coating.

Series production and sampling

For the automated coating process a minimum quantity is required, dependent on the seal’s size and material. Small quantities of seals up to 100 pieces can be coated manually for samples. This excludes Flexcoat™ LF color and CF color. However, to get a reliable comparison, it is recommended to test samples from an automated near-series production coating process.

Diagram shows the process flow for Handling Aids, Assembly Professionals and Application Professionals:

Diagram of the coating process for Assembly Professionals and Application Professionals

Coatings improve the friction characteristics of elastomer O-Rings.
<table>
<thead>
<tr>
<th><strong>Flexcoat™ PF</strong></th>
<th><strong>Flexcoat™ LF transparent</strong></th>
<th><strong>Flexcoat™ LF color</strong></th>
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<tr>
<td><strong>Type</strong></td>
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<td><strong>Detection</strong></td>
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<td><strong>Coating thickness</strong></td>
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<td>2–10μm&lt;br&gt;78.74–393.1μin</td>
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<td><strong>Temperature range</strong></td>
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<td>no substances requiring declaration according to VDA 232-100</td>
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<td><strong>Appearance</strong></td>
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<td><strong>Characteristics</strong></td>
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<td>computer-controlled, secure process, water-based</td>
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<td><strong>Base material types</strong></td>
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<td>all types of elastomers, except Silicones/Fluorosilicones (depending on formulation)</td>
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<td><strong>Available in labs-free quality</strong></td>
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<tr>
<td><strong>Application area</strong></td>
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<td>I + A</td>
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</table>

**Advantages**

| **Supply / separation** | | | |
| **Easier assembly/ once-only assembly** | | | |
| **Reduced insertion force / repeat assembly** | | | |
| **Reduction of stick-slip effects** | | | |
| **Low dynamic loadings** | | | |
| **General dynamic use (without limit)** | | | |

1. Important: The coating thickness is not quoted as a capability criterion but is for guidance only; deviations are possible depending on part geometry
2. Only valid for coating layer
3. Dependent on the part and the material, has to be requested specially
4. Available for special materials from Maltese production only
### Flexcoat™

<table>
<thead>
<tr>
<th>SF</th>
<th>DF</th>
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<tbody>
<tr>
<td>coating, PTFE</td>
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<tr>
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<td>UV-indicator</td>
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<tr>
<td>2–10μm 78.74–393.1μin</td>
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<td>-40°C to +150°C -40°F to +302°F</td>
<td>like NBR</td>
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<tr>
<td>no substances requiring declaration according to VDA 232-100</td>
<td>KTW possible</td>
</tr>
<tr>
<td>up to +4IRHD</td>
<td>up to +4IRHD</td>
</tr>
<tr>
<td>dry</td>
<td>dry</td>
</tr>
<tr>
<td>computer-controlled, secure process, water-based</td>
<td>environmentally -friendly process</td>
</tr>
<tr>
<td>all types of elastomers, except Silicones/Fluorosilicones (depending on formulation)</td>
<td>only NBR (black)</td>
</tr>
<tr>
<td>–</td>
<td>no coating layer</td>
</tr>
<tr>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>I + A</td>
<td>I + A</td>
</tr>
</tbody>
</table>

**Did you know?**

Segregating seals that seem to be similar is really important. An Ethylene Propylene Diene Rubber (EPDM) and Nitrile-Butadiene Rubber (NBR) O-Ring can appear identical, but the EPDM material is resistant to water and dissolves in oil while the NBR is resistant to oil and dissolves in water.
Allowing patients to have a natural gait, the new prosthetic knee from Freedom Innovations is industry-leading.
The new Plié™ MPC knee is, without a doubt, the quickest, most responsive microprocessor knee available. An industry-leading Actuator Response Time (A.R.T.), supported by advanced microprocessor programming, allows the knee to make nearly instantaneous adjustments to knee position and velocity. With a reaction time ten times faster than the blink of an eye, the device provides a precise response to actual gait dynamics as they occur, rather than a step behind. The result is a prosthetic knee that requires less cognitive effort, freeing the user to look beyond the next step and enjoy what lies ahead.

A computer-controlled damper makes all the difference

Trelleborg Sealing Solutions worked with Freedom Innovations to supply five components for a computer-controlled damper inside Freedom’s Plié™ MPC knee. Components included a Zurcon® AS Wiper, Zurcon® L-Cup, bushing, Turcon® Slydring® and custom FKM (fluoroelastomer) bladder, ensuring leak-free performance.

The damper is a monotube, with air on one side and oil on the other. Inside, the Zurcon® AS Wiper keeps contamination out. The Zurcon® L-Cup is the main rod seal, and the Turcon® Slydring® is the main piston seal. Absorbing side load, the bushing keeps the rod from hitting the sides of the damper, while the custom FKM bladder forms a barrier between the oil and the air. The end result is low friction, no stick-slip and no leakage.

Quality of life is what it’s all about

“We are happy to be able to help Freedom bring this product to the market,” says Jerome Zawada, Life Sciences Segment Manager for Trelleborg Sealing Solutions. “Not only will the Plié™ knee enable patients to have a more natural gait, it will also allow them to become more active. We are proud to be a part of a project that enriches the lives of those who have suffered the loss of limbs.”

When it comes to water resistance, no other microprocessor knee can compare to the Plié™. Activities once off limits are now fair game: boating, fly fishing and countless outdoor sports. Simple things such as washing a car or taking children to a water park can now be done with the safety of a microprocessor controlled knee. A replaceable battery pack gives the user an option of alternating a second battery so that the knee is never out of working order.

Who is Freedom innovations?

Freedom Innovations markets advanced technology prosthetic devices to provide amputees with solutions that create “a revolution in motion.” Based in Irvine, CA, Freedom distributes its lower-limb prosthetic products globally. The new Plié™ MPC Knee joins the company’s line of advanced prosthetic foot products to establish a new paradigm in performance prosthetics. Learn more by calling +1 (888) 818 6777 or by visiting www.freedom-innovations.com.
just around the corner at your local Trelleborg Sealing Solutions.

Welcome! Directly at check-in you will meet our friendly, helpful Sales and Application Engineers who globally deliver equally high levels of service and technical support. Our international network of over 70 facilities worldwide is at your service, wherever you are. We hope you enjoy your stay with Trelleborg Sealing Solutions and we look forward to seeing you again.

A pleasant surprise awaits you...

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