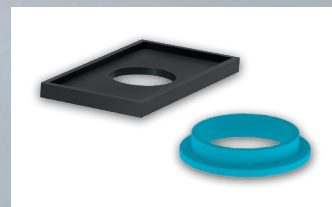
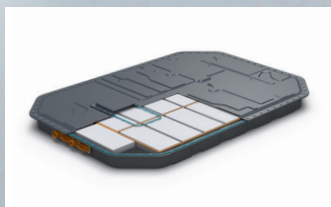
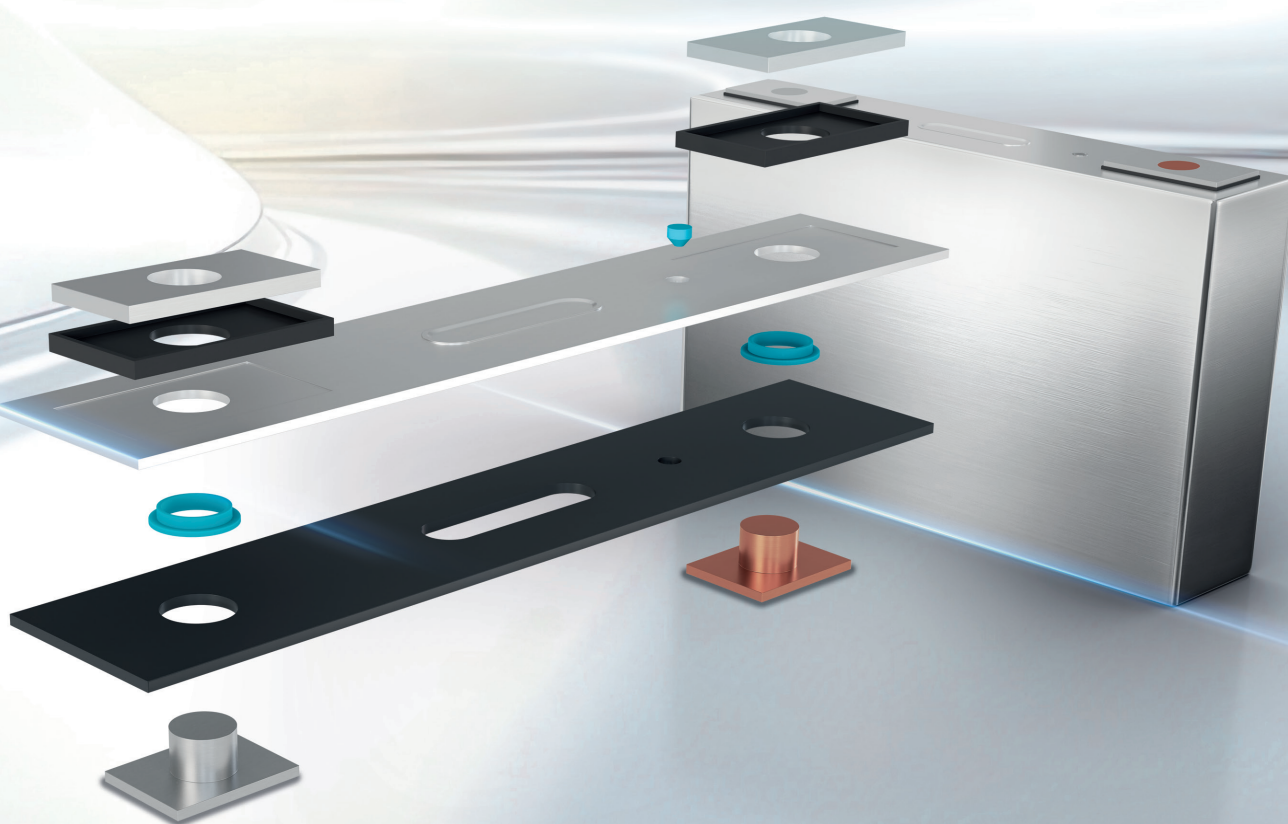


Battery Cell Sealing Solutions

BOOST BATTERY RELIABILITY WITH CELLXPRO™ SEALING MATERIALS



Supercharged Battery Materials

Electrification continues to be a major global trend, particularly in the automotive market. The push for CO₂-neutral mobility is transforming the automotive landscape. Sales of passenger and commercial battery electric vehicles (BEV) are expected to continue to grow significantly. The rising demand for electric cars is also increasing the need for battery cells, the smallest energy storage component within the battery pack.

One key challenge for vehicle manufacturers is improving battery range and reliability. This is powering the development of more sustainable, durable and high-performance batteries designed for faster charging. A critical factor in ensuring battery efficiency and longevity is the quality of cell components, especially the seals within the cell housing.

These seals are subject to high demands during operation and require excellent chemical compatibility. Using seal materials that are not compatible with the electrolyte solution in the battery cell can lead to seal failure and leakage. This in turn can harm hardware and the operating environment, decreasing cell performance and shortening battery service life.

At Trelleborg Sealing Solutions, we combine deep material expertise with advanced engineering and cutting-edge manufacturing capabilities to provide effective and efficient sealing solutions for battery cells. Our global automation expertise ensures reliable large-scale production.

Advanced materials

were crafted for
CellIXPro™

Full range of compounds

(PFA, FKM, EPDM)
enhances battery
reliability

Global manufacturing footprint

supports near-sourcing
strategies

Specially developed testing procedure

for optimal battery cell
sealing



CellXPro™



BOOSTING BATTERY RELIABILITY

Building on our expertise in specifying and testing of sealing materials for demanding applications, we offer a range of solutions for battery sealing of cylindrical and prismatic cells. Developed to meet your needs, our seals are manufactured using specialized, advanced elastomeric or thermoplastic materials, ensuring exceptional performance and reliability.

Collaborate With Us

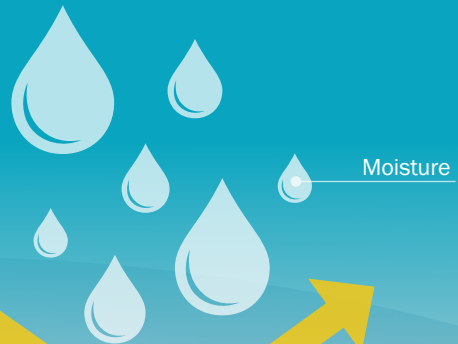
Do you need a battery sealing solution? Let's partner to develop innovative electric vehicle battery technology. We can support you with the development of a solution to meet your unique requirements. Reach out to us to find out how we could work together.



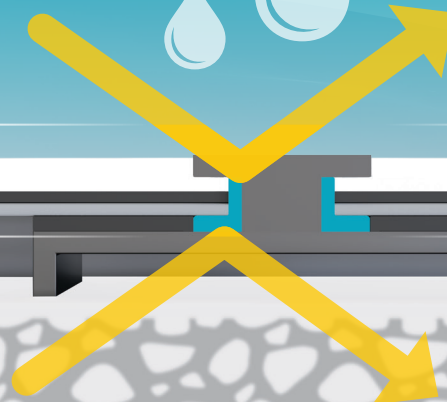
www.trelleborg.com/en/seals/contact-form

Features & Benefits

- **Hermetically seals the battery cell housing** to prevent leakage and contamination from moisture, dirt or other debris for its entire service life
- **Reliable sealing performance** in challenging conditions, including high temperatures and exposure to electrolytes or their gases
- **Extends battery cell lifespan** and delays loss of cell performance
- **Outstanding chemical compatibility** with battery electrolytes
- **Acts as an insulator** between electrodes, preventing short circuits
- **Customized design capabilities and process expertise** enable efficient and scalable production
- **Global manufacturing capabilities** support local sourcing



Moisture

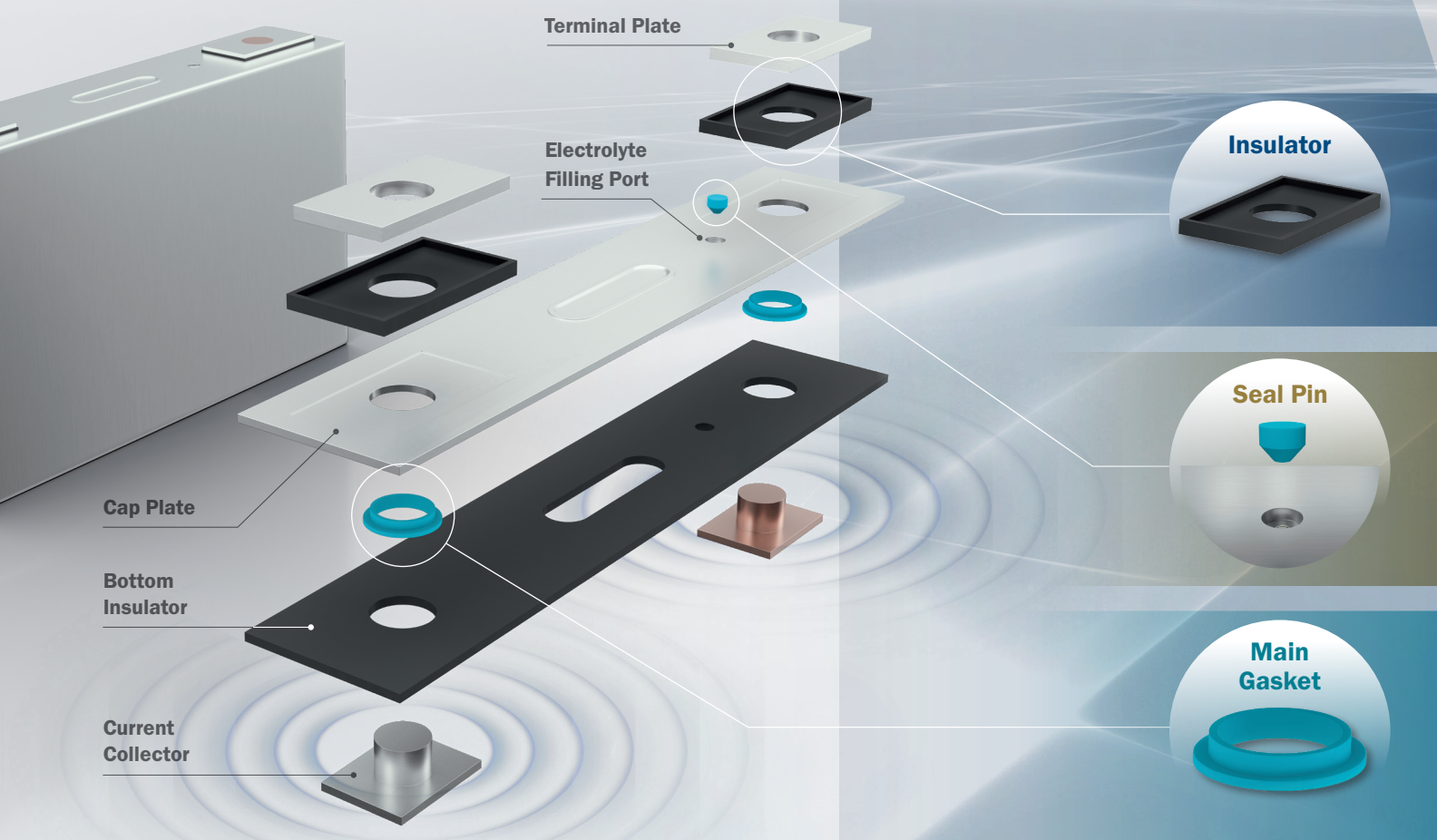


Electrolyte

Sealing Battery Lids

Battery cells are categorized into three types: pouch, prismatic and cylindrical. Prismatic and cylindrical cells have rigid housings with a lid assembly that includes polymer-based components for functionality and safety.

Trelleborg Sealing Solutions specializes in providing precision-engineered gaskets and insulators for lid assemblies, delivering unmatched reliability, durability and safety in demanding applications.



The lid assembly of a prismatic cell, as shown, features a simplified design that ensures battery integrity through advanced sealing and insulating solutions.



Watch the
Battery Cell
Sealing Film

Each component within the lid assembly serves a unique and critical purpose:

The insulator is vital for maintaining electrical isolation. It prevents contact between internal components, such as the pole and the cover, ensuring electrical safety and operational efficiency.

The seal pin plays a pivotal role in the electrolyte filling process. It provides a preliminary and final closing of the filling opening, ensuring precise control and minimizing the risk of contamination.

The main gasket creates a secure seal against external elements such as moisture, while preventing electrolyte leakage. This ensures operational reliability and supports environmental safety. In addition, the gasket offers insulating properties.

Developing Your Design

At Trelleborg Sealing Solutions, our three-step process ensures battery cell seals meet customer needs and the highest safety standards.



Step 1: Material Selection

The first step is selecting the best material from our broad portfolio to match your specific criteria. We provide expertise around the globe with a dedicated network of polymer experts.

Our cutting-edge materials, including elastomers, thermoplastic elastomers and thermoplastics, undergo extensive testing to prove their performance and ensure they meet the unique demands of your operating environment.



Step 2: Design

Next, we leverage our decades of knowledge in sealing solutions to create designs tailored to your application. Designs prioritize manufacturability and ease of assembly. Using advanced tools like Finite Element Analysis (FEA), we validate each design.

For more complex applications, multicomponent solutions integrate multiple features into a single, customized product. For example, a lid can combine aluminum, elastomer seals and thermoplastic insulators into one unit, reducing assembly steps, saving time and increasing quality of the sealing interface.



Step 3: Processing

Once material and design are specified, the solution is produced using advanced manufacturing technologies. Our capabilities include high-volume production using fully automated cells, rigorous functional testing and customizable packaging and labeling. With facilities located around the globe, your near-sourcing strategy.

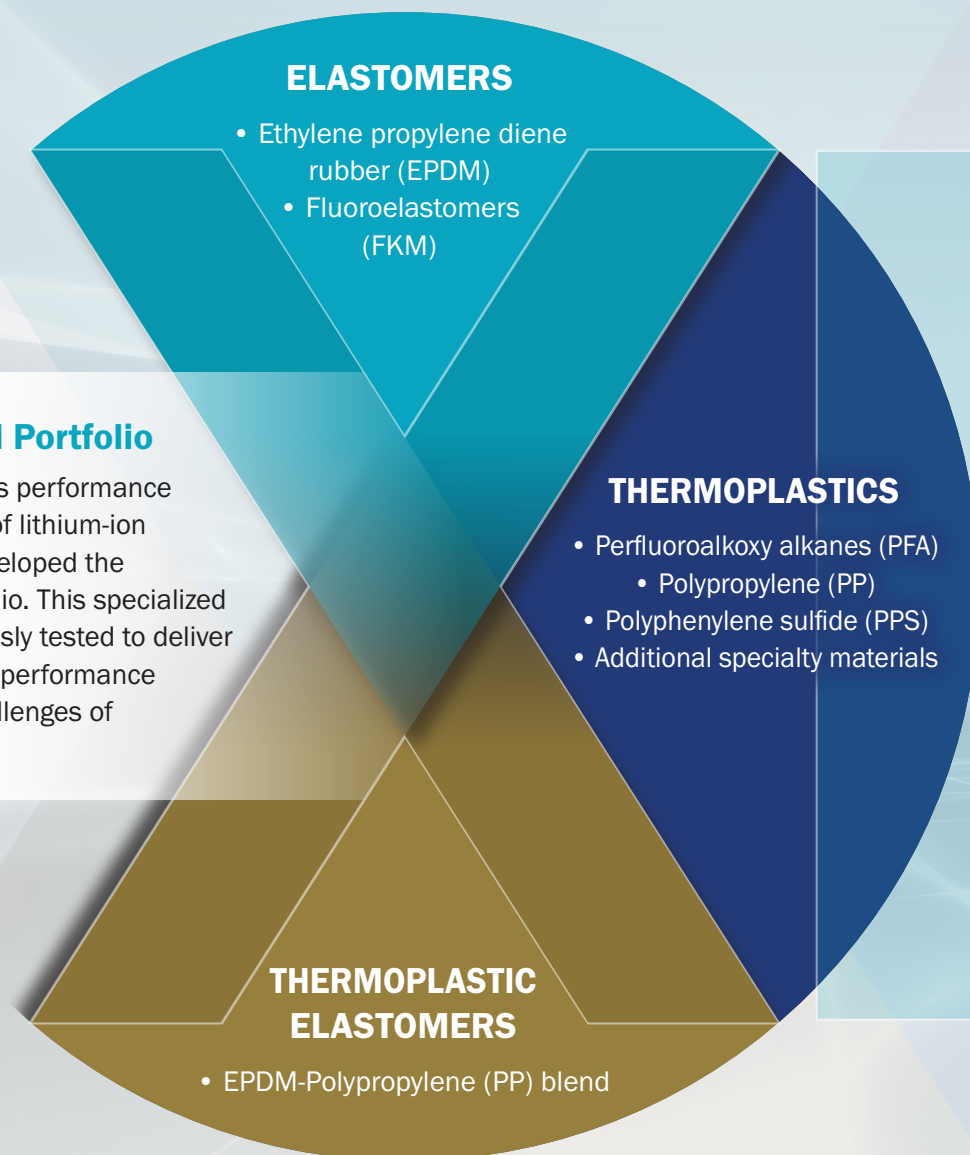
Processing elastomers like ethylene propylene diene monomer (EPDM) or fluorocarbon (FKM) is straightforward, but perfluoroalkoxy alkane (PFA) requires a special approach. During processing, PFA can release hydrofluoric acid, which damages tools and causes rapid wear. Utilizing our in-house knowledge and capabilities, we efficiently process PFA for large-scale production.

CellXPro™ Materials



CellXPro™ Material Portfolio

In response to the rigorous performance and safety requirements of lithium-ion battery cells, we have developed the CellXPro™ material portfolio. This specialized range has been meticulously tested to deliver exceptional reliability and performance tailored to the unique challenges of battery environments.



CellXPro™ Elastomers for Better Battery Performance

Our high-performance CellXPro™ elastomers include FKM and EPDM compounds. While FKM materials are traditionally used, EPDM materials offer a cost-effective and PFAS-free solution. CellXPro™ elastomers are built and validated to withstand the tough conditions of battery cell environments, featuring:

- **Temperature Stability:** Perform consistently under varying thermal conditions
- **Media Compatibility:** Resist degradation from electrolytes and gases
- **Permeation Control:** Prevent moisture and gas leakage
- **Electrical Properties:** Adapt to electrical environments
- **Material Synergy:** Integrate effectively with key materials like copper and aluminum

* PFAS are not intentional ingredients in EPDM. To the best of our knowledge and based on available information, this EPDM does not contain PFAS. However, it cannot be guaranteed that it may not contain trace amounts of PFAS that occur unintentionally.

Sealing Material Performance

When it comes to sealing materials various performance criteria are taken into consideration. Two examples include minimal change in tensile strength and swelling once exposed to the application media, as well as minimal permanent deformation when subjected to compression cycles, also known as compression set.

Proven Compatibility

To verify the performance of CellXPro™ elastomers with battery cell electrolytes, we subjected the materials to a rigorous testing regimen. Our CellXPro™ EPDM outperformed standard EPDM and FKM materials. Tensile strength tests, conducted over 1,008 hours at +80 °C/+176 °F in an electrolyte environment, reveal its exceptional durability.

CellXPro™ Thermoplastics for Battery Applications

While thermoplastics are not typically used for sealing, PFA stands out. Its chemical inertness prevents electrolyte contamination, making it ideal for battery cell components.

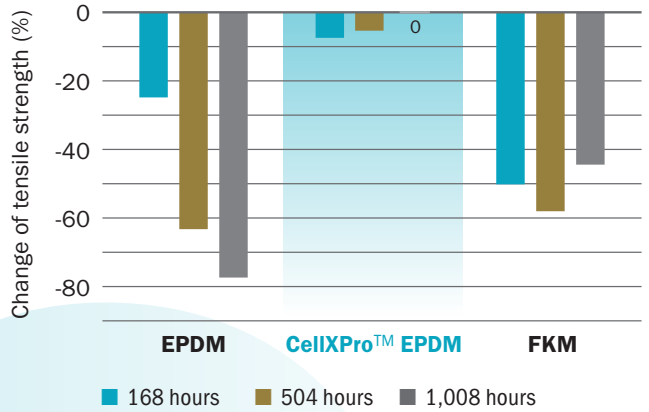
Key Features of PFA:

- Versatility: PFA can be used as a seal and as an insulator in applications. For high chemical resistance requirements PFA can be used as an insulator instead of PP or PPS.
- High compression set performance compared to other thermoplastics

With its unique properties, PFA delivers outstanding performance, reliability and safety in demanding battery applications.

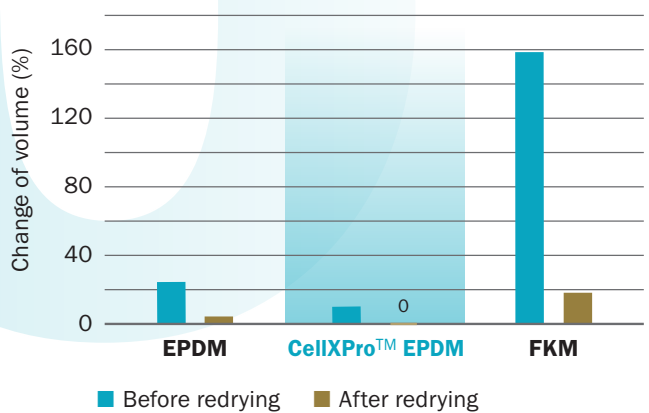
Tensile Strength

+80 °C/+176 °F with electrolyte LP572



Swelling Behavior

1,008 hours at +80 °C/+176 °F with electrolyte LP572



Expert Materials and Polymer Engineering Support

Electrification is driving demand for reliable, high-performance batteries, especially in the automotive market. Improving battery range and reliability depends on quality components such as seals and insulators.

Trelleborg Sealing Solutions provides advanced sealing solutions with expert materials, engineering and global manufacturing to boost battery performance and lifespan. Using specialized compounds (PFA, FKM, EPDM) and advanced testing, they ensure top performance for EV batteries.

Contact us for support with your battery cell sealing solutions.



www.trelleborg.com/en/seals/contact-form

Trelleborg is a world leader in engineered polymer solutions that protect essential 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.

WWW.TRELLEBORG.COM/SEALS



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