

# SEALING OF BATTERY HOUSINGS FOR E-BIKES AND E-SCOOTERS



# System solutions for sealing battery housings for e-bikes and e-scooters

In the sharing economy, the focus is no longer on ownership but on the service: Instead of owning a car, mobility itself is far more important. It should be digital and emission-free. Urban micromobility in particular is becoming increasingly electrified, and air quality is improving as a result. New urban mobility concepts are becoming essential due to the growing number of pedestrian zones in city center and raising cost of fuel and car parking. Where public transit coverage ends, new forms of transportation like e.g. battery-powered e-scooters can have a positive impact on often crowded city streets and parking lots.

E-scooters and e-bikes are particularly suitable as a means of transport for the first and last mile to the destination. A wide range is available to those who want to get from the train station or parking lot to their workplace, or go shopping in the city center. Various rental and sharing services are recording enormous levels of growth. Some e-scooters are folding and portable, and can be conveniently taken along in subways or buses. In effect, this means you can ride from your front door to your desk.

When it comes to sealing your battery housings for e-scooters and e-bikes, are you looking for a solution consisting of a material system, dosing system and process automation from a single source?

Our perfectly coordinated system solutions enable you to reliably seal a wide variety of battery housing designs against moisture and shocks allowing robust use in road traffic.

Do you need an automation system that adapts to your production requirements?

The modular design of our mixing and dosing systems allows flexible use, with excellent integration into existing production concepts. These can be operated easily and intuitively without requiring much training. Our robot-controlled mixing and dosing systems offer high levels of repeatability and dosing accuracy, and are highly efficient thanks to systematic process monitoring.

Our solutions therefore offer you precisely the levels of durability, quality and reliability that your customers expect from your products.



# Tailored material systems for maximum product safety

We carry out developments individually for your specific requirements

For sealing the battery housings of e-bikes and e-scooters, we provide you with a perfectly coordinated system solution consisting of a sealing foam or potting compound that meets your requirements, as well as a mixing and dosing system for high-precision, fully automatic material application controlled by contour robots.

For the seamless sealing of battery housings, we supply the reference material FERMAPOR K31-A-9675-5-VP and B-4 (B-component). This 2-component polyurethane foam has proven effective over many years in use by leading manufacturers, and reliably seals battery housings against moisture and other external influences. The foam gasket is seamlessly applied with our fully automatic dosing machine, providing excellent sealing in the installed state due to compression of the foam structure.

Our 2-component FERMADUR polyurethane potting systems are used to seal the electrical connections and electronics of e-bikes and e-scooters against moisture and shocks. The two material systems for sealing foam and potting can also be processed in combination with a mixing and dosing system for 3 components.



The different reaction phases of the sealing foam in the chronological sequence



FERMAPOR K31-	A-9675-5-VP
	B-4
<b>Mixing ratio</b>	4.5 : 1
<b>Pot life time</b>	40 sec.
<b>Tack-free time</b>	7 min.
<b>Viscosity of the A component</b>	1,500 mPas
<b>Density of the foam</b>	0.23 g/cm <sup>3</sup>
<b>Hardness (Shore 00)</b>	43
<b>Temperature resistance</b>	from -40 to +80 °C
<b>Pretreatment</b>	Adheres well to powder-coated surfaces. To improve adhesion on plastic and metal surfaces, pretreatment can be carried out using corona, flame, primer or plasma.



Cross-section of a polyurethane foam bead in the groove without compression



Cross-section of a polyurethane foam bead in the groove and compressed to approx. 50 %

Alternatively, we can also customize our sealing foams and potting systems to meet your component requirements. Influencing factors include pot life until start of foaming, curing time, and the viscosity, hardness and adhesion properties. Thanks to the mixed-cell foam structure, the closing forces when installing the foam gasket are low.

Due to its excellent shape recovery characteristics, the mixed-cell foam structure of the polyurethane seal can still be compressed well even after years (tested according to DIN EN ISO 1856). It is therefore possible to repeatedly open and close the battery housing for battery changes, and the sealing effect of the foam gasket remains consistent.



The battery housing sealed with PU foam can be opened and closed again at any time for a battery change, with the sealing effect of the foam gasket remaining consistent.

## Flexible and fully automatic – fully in line with your requirements

### Mixing and dosing system with 6-axis robot and shuttle table for sealing battery housings with sealing foam

The reference configuration shown here for sealing the battery housings of e-bikes and e-scooters consists of the DM 502 mixing and dosing system and the MK 825 PRO precision mixing head, as well as a 6-axis robot and the WT 1-LEVEL shuttle table. Parts are picked up and processed here in continuous shuttle mode, operating in a single plane. The battery housing to be sealed is positioned and fixed in place on the shuttle table, either by a machine operator who can also check the parts for quality, or alternatively by a Pick & Place Robot. In the latter case, an optionally installed camera or sensor system could carry out the quality control of the parts.

The precision-contour, robot-controlled Formed-In-Place-Foam-Gasket (FIPFG) application process is crucial in precisely applying sealing foams into the housing groove of the battery housing. The 6-axis robot used ensures repeatable accuracy in guiding the robot arm's MK 825 PRO precision mixing head over the component. In this process, the 2-component polyurethane sealing foam is applied very precisely into the groove of the two or three-dimensional battery housing. After the dosing cycle, the coupling point of the room-temperature curing foam gasket closes seamlessly, and is thus almost invisible. Even with short cycle times and high unit numbers, the material application process using the FIPFG method is carried out with high dosing precision and repeat accuracy.

As a result, you achieve foam gaskets of uniformly high quality. During final assembly of the battery housing, the foam gasket applied is evenly compressed over the entire housing contour, and once installed will result in a high degree of tightness compliant with IP protection classes. It compensates for component tolerances when sealing, and has a very high temperature resistance from -40 to +80 °C.

In addition, our fail-safe mixing and dosing system can be operated easily and intuitively without the need for extensive training. Thanks to the automatic logging of dosing program data, all process data can be traced and evaluated by the machine operator via the CONTROL 2 operating panel while production is running. In all solutions, our main focus is on extremely reliable plant engineering, minimized maintenance times and consistent dosing quality.



Optionally available: **CONTROL 2 touchscreen operating panel** (21.5") for operating the dosing system



**WT 1-LEVEL shuttle/sliding table**  
Two pick-up plates operating in shuttle mode in one plane

**MK 825 PRO precision mixing head** with high-pressure water rinsing



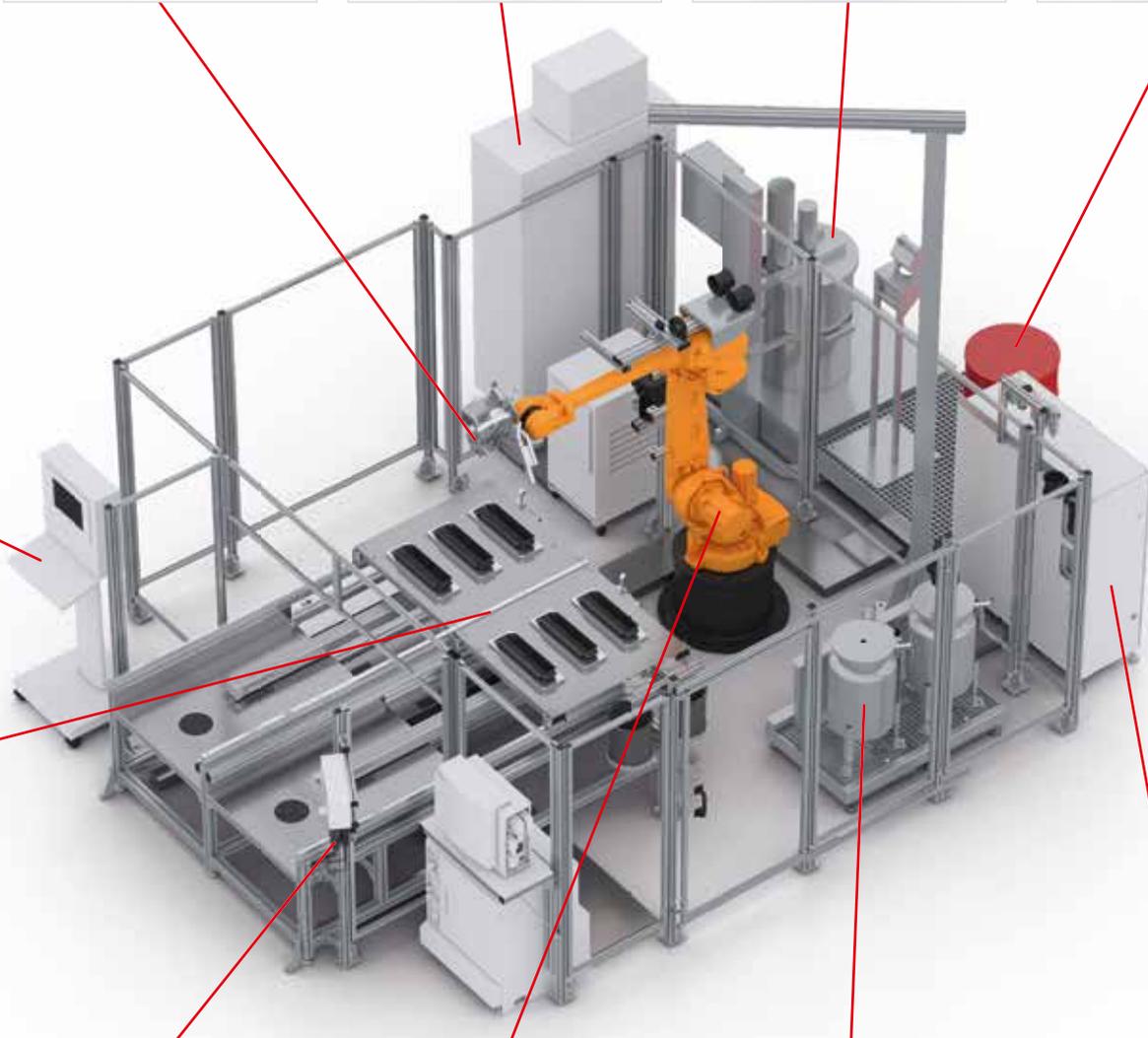
The control electronics, safety engineering and industrial PC are installed in the **control cabinet**.



Optional: Automatic **ELEVATOR drum refilling station** for the **A component** with pneumatic lift and agitator



Optional: Automatic **SUPPLY TAB drum refilling station** for low-viscosity products, e.g. isocyanate (**B component**)



The multifunctional **MP 2 mobile panel** (10.1" WXGA TFT) enables convenient operation of the dosing system.



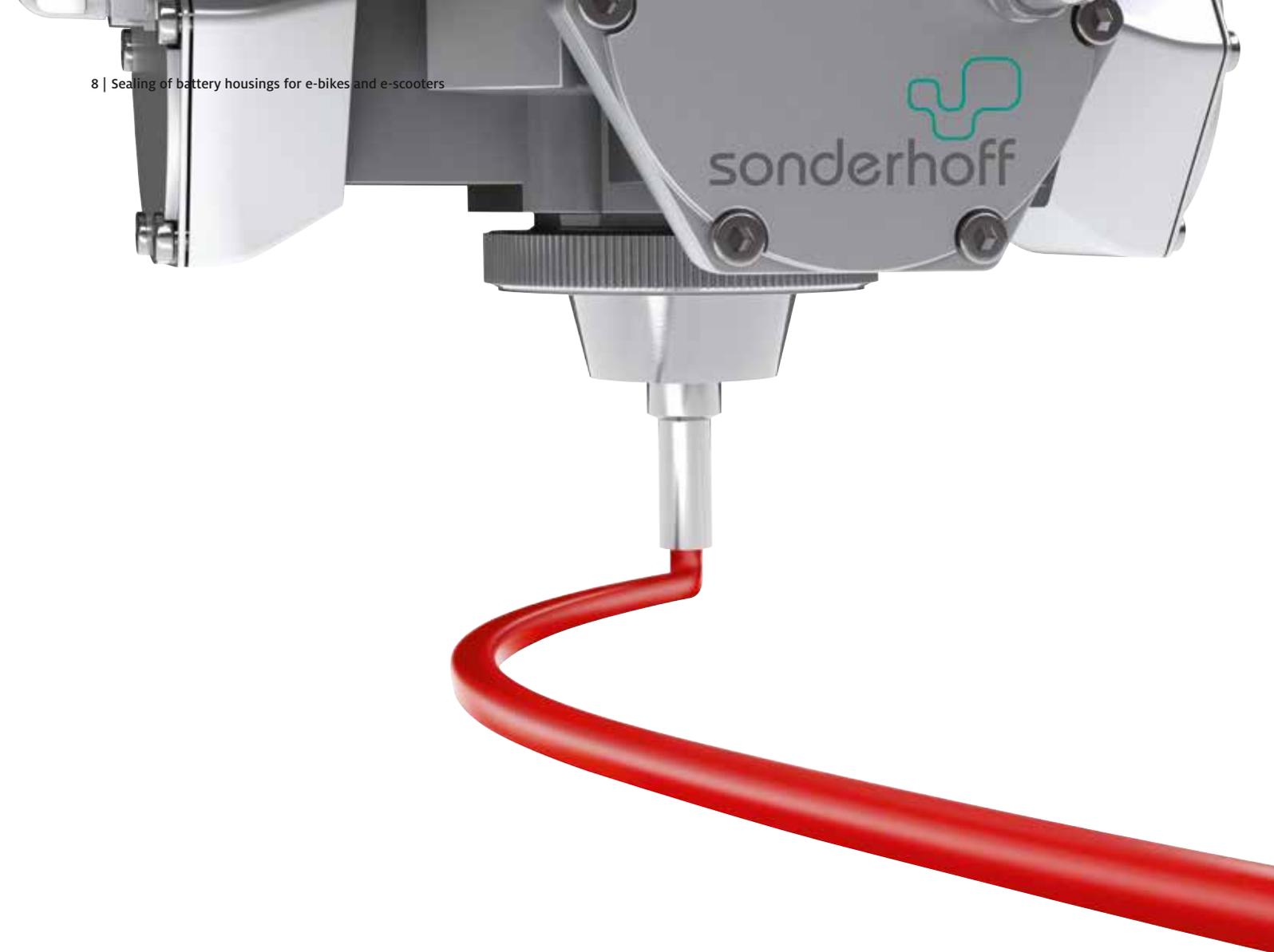
The **6-axis robot** guides the mixing head precisely over the housing contours during dosing application.



Separately installed **material pressure tanks** (24 l or 44 l, single-walled or double-walled) with minimum level sensors, on a grating platform with adjustable leveling feet and drip tray



The **dosing machine cabinet** contains the components of the dosing periphery, e.g. the dosing pumps.



## This is why you should use the FIPFG technology in your production process

- +** **Advantages of the Formed-In-Place Foam Gasket Technology**
- › Sealing standard in many industrial sectors
  - › Highly accurate material application controlled by contour robots
  - › Processing and full curing at room temperature
  - › Perfect coordination of the material system and dosing system
  - › Suitable for 2D and complex 3D part geometries
  - › More efficient use of materials compared to punched seals
  - › Cheaper compared to 2-C injection molding, as there are no tooling costs
  - › High degree of future viability, due to suitability for use in a wide variety of industries & applications



### Advantages of our mixing and dosing machines

- › Combination of processes (bonding, foaming, caulking, potting)
- › High flexibility of the dosing system
- › Simple, intuitive operation
- › Automatic material preparation incl. handling
- › High dosing and repeat accuracy
- › Short machine downtimes and cycle times
- › Fine-cell foam structure due to dynamic mixing
- › Reproducible foam quality
- › Ecological high-pressure water rinsing
- › Easy maintenance



### Advantages of our FIPFG foam gaskets

- › More cost-effective than compact systems due to lower foam density
- › Seamless seal / hardly visible coupling point
- › Compensation of component tolerances
- › Good resilience
- › Multiple compression and release processes possible
- › Broad range of properties / wide variety of recipes
- › Individually adaptable recipes
- › Good form fit to the component contour
- › Resistant to moisture, dust, temperature & media
- › Flame-retardant according to UL 94
- › IP classes up to IP 68 or NEMA 4 to 6 and NEMA 12
- › Special PU foam with low VOC emissions
- › Very fast reacting PU foam (Fast-Cure)

## Perfectly coordinated solutions of material, machine and contract manufacturing

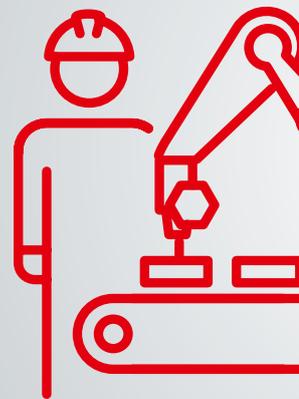
With its Sonderhoff brand, Henkel has not only acquired many years of experience in the manufacture of tailor-made two-component sealing systems and mixing and dosing machines, but also as a process expert for application-specific material application using the FIPFG (Formed-In-Place-Foam-Gasket) technology.

With the Sonderhoff portfolio, we offer you the advantages of a system provider from a single source and the solutions to meet your technical and commercial challenges.

With the dosing technology that is tailored to our sealing foams, we ensure efficient production processes in accordance with the requirements of fully automated series production.

If you would like to take advantage of all the benefits of the FIPFG technology for your production in a flexible, fast, uncomplicated manner and without having to make your own acquisition investments, we can provide expert sealing for your components at one of our contract manufacturing sites worldwide. There, the spectrum ranges from the sampling of prototypes and small batch series to production scale manufacturing.

The choice is yours! You can either decide in favor of our all-inclusive package, consisting of material, machine and contract manufacturing, supported by application advice, sampling and training or you can choose the individual solutions that suit you best. We combine our products and services from a single source in such a way that you receive the optimum solution for your requirements profile.



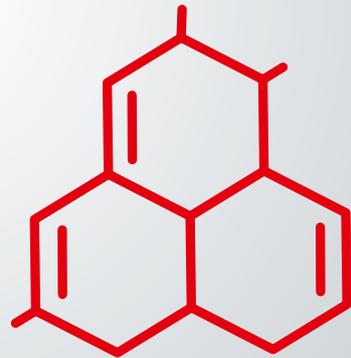
**MANUFACT**

# *Flexibility & Precision*



**EQUIPMENT**

# Automation Solutions



**MATERIALS**



**URING**

## Customer-specific solutions – worldwide and for many industries

The Henkel specialists for the Sonderhoff portfolio  
are available to you worldwide

**KOLO, POLAND**  
External Subcontracting Location

**LONDON, GB**  
External Subcontracting Location

**COLOGNE, GERMANY**  
Center of Expertise

**ELGIN, ILLINOIS, USA**  
Regional Hub

**RICHMOND (KANSAS CITY), USA**  
Regional Hub

**DORNBIRN, AUSTRIA**  
Center of Expertise

**BARCELONA, SPAIN**  
External Subcontracting Location

**OGGIONO, ITALY**  
Regional Hub

**INCHEON, KOREA**  
External Subcontracting Location

**SHANGHAI, CHINA**  
Regional Hub

**PUNE, INDIA**  
Regional Hub

**PUNE, INDIA**  
External Subcontracting Location

**SÃO PAULO, BRAZIL**  
External Subcontracting Location

*Global presence*



Every year, more than 300 million seals are manufactured in more than 50 countries using products from the Sonderhoff portfolio. At our “Centers of Expertise” and “Regional Hubs”, our specialists offer application engineering advice, e.g. on the selection of a suitable material system and the sampling of your components, as well as project management for dosing systems and automation. You will receive training from us on how to handle the FIPFG technology and we will support you with the selection of spare parts and regular service. Furthermore, we will be pleased to take over parts of your production for you – from small to large series – at our subcontracting locations.

Sales staff at all other Henkel locations worldwide will also be happy to answer any questions and provide you with further information on our sealing, bonding, caulking and potting solutions. We look forward to hearing from you.



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