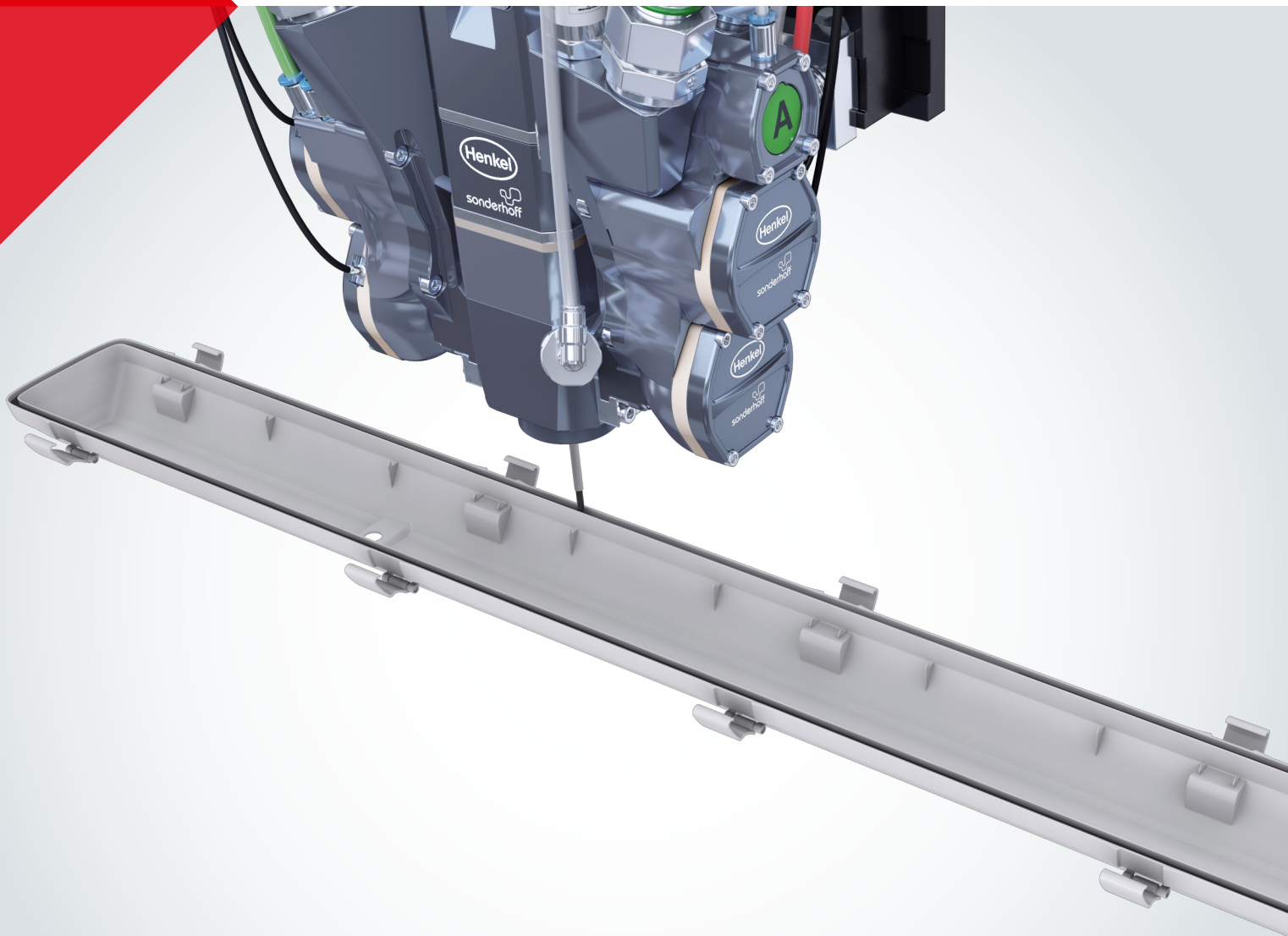


SEALING OF LUMINAIRE HOUSINGS



Best possible luminosity due to highest level of impermeability

For the reliable sealing of luminaire housings

The quality of a lighting system depends crucially on how reliably the luminaire housings are sealed. With our high-quality, efficient sealing and potting solutions using automated Formed-In-Place-(Foam-Gasket) technology, we offer you optimal protection for your light fixtures and lighting systems.

For years, the leading manufacturers of lighting products have been placing their trust in our dosing technology and wide selection of innovative material systems for sealing their luminaire housings.

Whether for street lighting, building lighting, wet-room lighting or illuminated signs: Henkel's innovative 2-component material systems based on polyurethane or silicone for sealing and potting of luminaire housings and lighting electronics can be found in countless applications. You can choose from FERMAPOR K31 sealing foam systems for sealing light fittings for indoor and outdoor use, for example, to protect illuminated signs against water from sprinkler systems in the event of a fire. Or, we offer you FERMADUR potting systems for encapsulating LED lightings. We also supply the highly temperature-resistant silicone foam systems from the FERMAPOR series. In addition, the special properties of our silicone foam formulas fulfill the requirements for sealing ATEX-tested light fixtures in hazardous environments such as e.g. the mining industry or on drilling platforms.

Are you looking for more efficient, more economical material usage for sealing your light fixtures than can be achieved with conventional seals, for example rubber seals? Or maybe a cheaper solution than 2C injection molding without tooling costs?

We supply you with a cost-efficient and perfectly coordinated system solution comprising both the machine and the material. For housing sealing or LED potting applications, we formulate a sealing foam to fit your requirements. The metered application directly onto the component is fully automatic, high-precision, and delivered with process stability by our mixing and dosing machine.

Do you also ask yourself how you can make your production processes more efficient with large quantities and short cycle times?

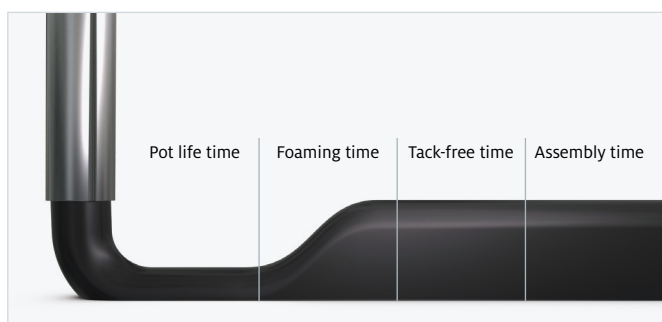
Using our fast-reacting FERMAPOR K31 FAST-CURE polyurethane foam gasket systems, you can make cost-efficient and optimized manufacturing processes a reality. Long curing times (or intermediate storage) for parts that have just been sealed are thus a thing of the past, because the short tack-free times of the sealing foams allow the luminaire housings to be rapidly processed through to final assembly.



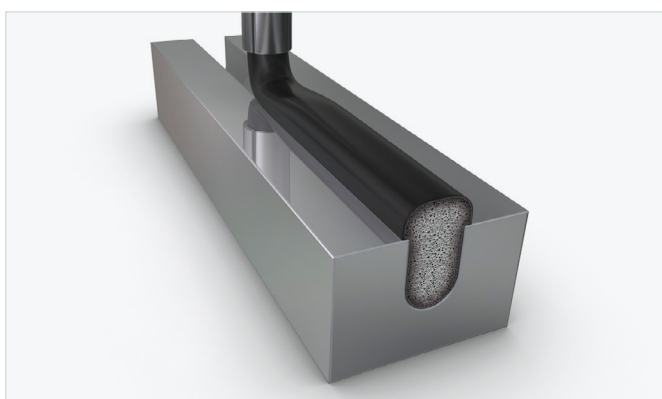
Reliably protecting lamps and lighting electronics in linear luminaires

To ensure that lighting systems function reliably, whether in neon tubes, energy-saving bulbs, halogen or LED lighting technology, the luminaire housing needs to be sealed against moisture, dust and other environmental conditions. Thanks to the excellent long-term behavior of our sealing foams, we meet your requirements for resistance to the influence of temperature and UV, as well as preventing the penetration of water and dust into the luminaire housings, corresponding to IP protection classes and NEMA enclosure types.

Moisture in wet rooms can lead to short circuits causing considerable damage to the light fittings and their electrical connections. Special linear luminaires, known as damp-proof luminaires, are used in wet rooms and unprotected outdoor areas. The housings of these light fittings are seamlessly sealed with a 2-component polyurethane foam from the FERMAPOR K31 product family. This is achieved using our dosing technology through the precise application of the still-liquid material into the housing groove. Foaming in the groove creates a soft foam gasket, which cures at room temperature and has a virtually invisible joint.

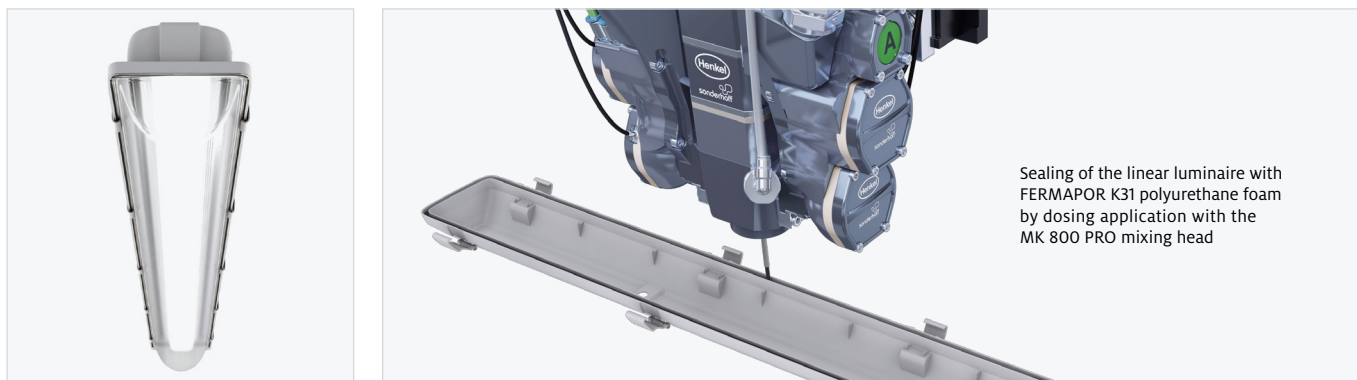


The different reaction phases of the sealing foam in the chronological sequence



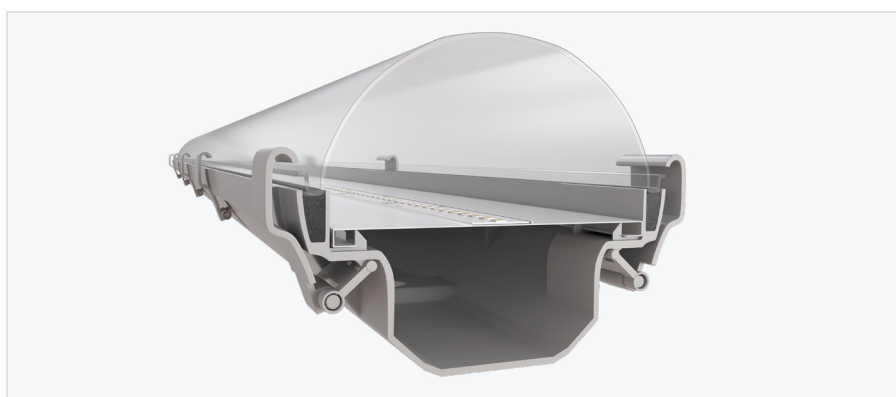
Sealing of the luminaire housing groove with FERMAPOR K31 polyurethane foam

	Indoor lighting	Outdoor lighting	Ex (e.g. mining, off-shore drilling platforms)
	FERMAPOR K31-A-4502-1-B	FERMAPOR K31-A-9675-2-VP	FERMASIL A-91-VP2
	FERMAPOR K31-B-4	FERMAPOR K31-B-4 (UL 50e)	FERMASIL B-91
Mixing ratio	4 : 1	4 : 1	1 : 1
Pot life time	40 sec.	38 sec.	56 sec.
Tack-free time	8 min.	3.5 min.	5 min.
Viscosity of the A component	2,500 mPas	1,800 mPas	15,000 mPas
Density	0.20 g/cm ³	0.34 g/cm ³	0.30 g/cm ³
Hardness (Shore 00)	40	64	52
Temperature resistance	from -40 to +80 °C	from -40 to +80 °C	from -60 to +180 °C
Pretreatment	Plasma, Corona or Primer	Plasma, Corona or Primer	Primer P8 or TEROSON SB450

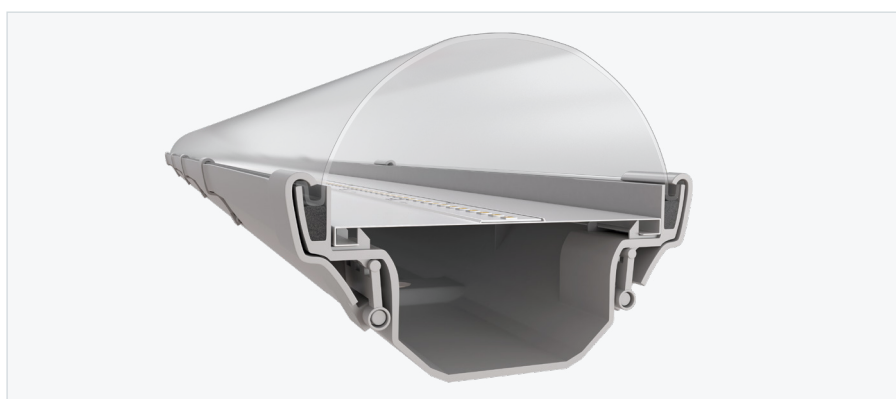


The closing mechanism used for sealing the transparent covers of linear luminaires works by pressing the foam gasket into the housing groove. This seals the light fixture ensuring that moisture is unable to penetrate inside the housing. Thanks to the good resilience of the foam gasket, the luminaire cover can be opened and closed again for maintenance purposes, while maintaining a consistently tight seal. Our sealing foams can be adjusted to be very soft for easier closing. This also prevents bending in housings with thinner walls.

Special 2-component silicone sealing foams from the FERMASIL product family likewise meet the stringent requirements for ATEX approval of your explosion-protected luminaires, as summarized in the IEC 60079 standard for electrical equipment with explosion protection. They are suitable for luminaire housings used in explosive hazardous environments, such as in the mining industry or on off-shore drilling platforms.



Linear luminaire in open position, the seal is uncompressed



Linear luminaire in closed position, the seal is compressed

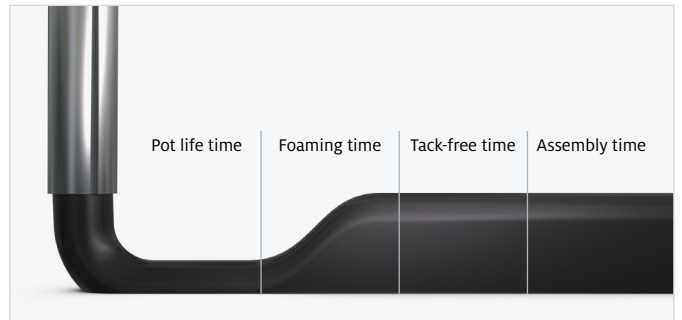


Reliable illumination from street lights, even in extreme weather

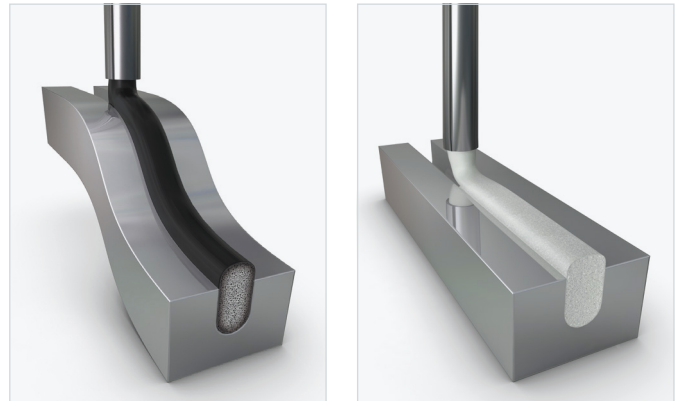
Street lights are sometimes exposed to extreme weather conditions. Regardless of whether they are fluorescent lamps, high-pressure sodium lamps or LED systems; the lamps, ballast and electrical components must be protected from rain, dust, sunlight and other weather conditions.

The street luminaire housings, which are usually made of die-cast aluminum or glass-fiber-reinforced plastic, are equipped with a seamless seal in the housing groove using polyurethane or silicone sealing foams. Depending on requirements, the weatherproof protection of the light sources and electrics used demands the highest IP protection ratings for the entire construction of the housing, housing cover and seal: up to IP 68 with outdoor-rated FERMAPOR K31 polyurethane foam, or up to IP 69K or NEMA 4-6p with FERMASIL silicone foam.

Our temperature-resistant silicone foam gaskets are particularly UV-resistant and offer lasting protection even at very low and high temperatures, from -60 to +180 °C. Thanks to the virtually closed-cell foam structure, the silicone gasket is highly water-repellent.



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



Sealing the 2D or 3D lamp housing groove with FERMAPOR K31 polyurethane foam or FERMASIL silicone foam

	Street lighting	Outdoor street lighting
	FERMASIL A-3150-1	FERMAPOR K31-A-5555-1-G
	FERMASIL B-3130-1	FERMAPOR K31-B-4
Mixing ratio	1 : 1	1 : 1
Pot life time	38 sec.	35 sec.
Tack-free time	13 min.	4 min.
Viscosity of the A component	98,000 mPas	55,000 mPas
Density	0.32 g/cm ³	0.27 g/cm ³
Hardness (Shore 00)	40	54
Temperature resistance	from -60 to +180 °C	from -40 to +80 °C
Pretreatment	Plasma, Corona or Primer	Plasma, Corona or Primer



Enlarged view of polyurethane foam gasket FERMAPOR K31 automatically applied into the lamp housing groove



Illustration of the seal with the street light in open position, the seal is uncompressed

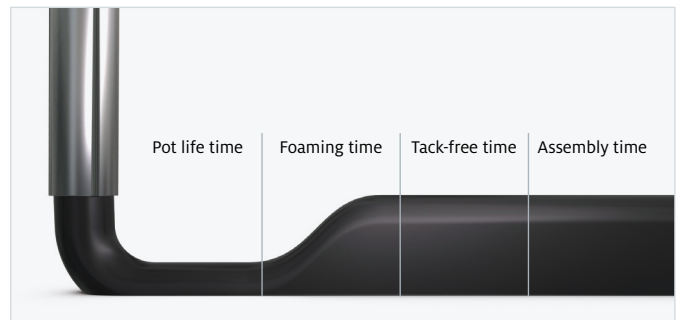


Illustration of the seal with the street light in closed position, the seal is compressed

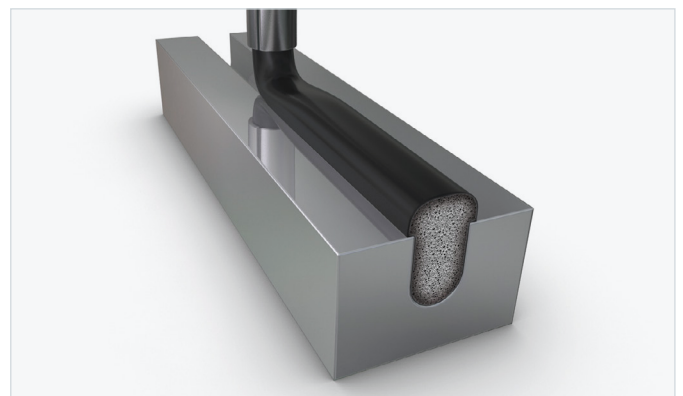
Sealing of illuminated signs and LED potting for optimum protection and light transmission

Illuminated signs, mostly equipped with LED lighting technology, are of critical, life-saving importance in emergencies as a route-finding system, e.g. improving orientation within a building to allow rapid evacuation in the event of a disaster. Legal regulations require those highly visible illuminated signs to be installed in offices, production facilities, public buildings, underground garages and tunnels. For example, in the event of a fire they must function longer than standard light fixtures. They need to be sealed against the fire-fighting water from sprinkler systems in case of a fire in order to prevent the lighting electrics from being shorted out by moisture inside the housing which would cause the signs to fail.

For these housing seals, we use our FERMAPOR K31 series of 2-component polyurethane foams which have excellent long-term properties and very good resilience. This allows the illuminated sign housings to be repeatedly opened and closed for maintenance purposes without any reduction in the tightness of the housing seal.



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

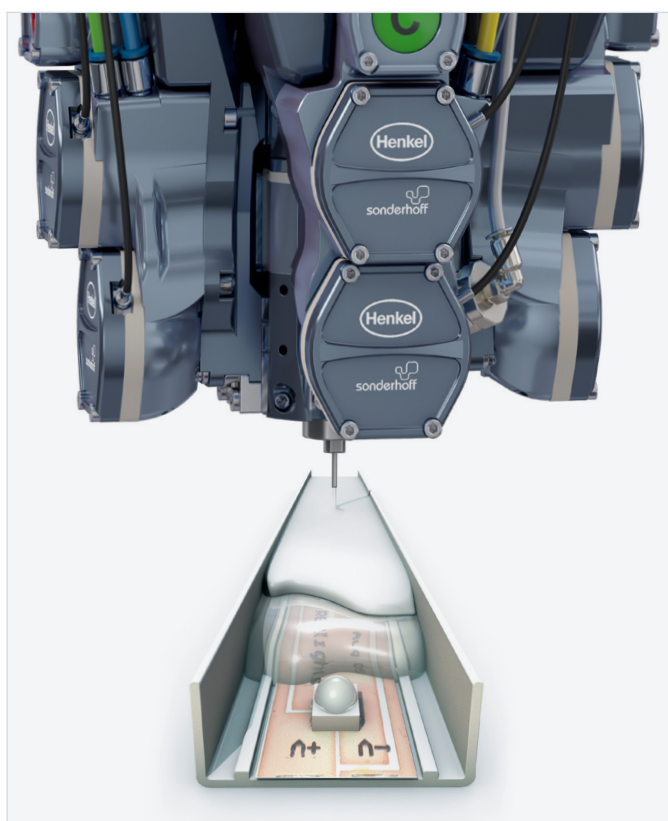


Groove sealing of the illuminated sign with FERMAPOR K31 polyurethane foam

	Special lighting (illuminated signs)	Special lighting (LED potting)
	FERMAPOR K31-A-9675-2-VP	FERMADUR A-70A01-2-CL
	FERMAPOR K31-B-4 (UL 50e)	FERMADUR B-136
Mixing ratio	4 : 1	0.95 : 1
Pot life time	38 sec.	480 sec.
Tack-free time	3.5 min.	10 min.
Viscosity of the A component	1,800 mPas	950 mPas
Density	0.34 g/cm ³	1.13 g/cm ³
Hardness	64 (Shore 00)	70 (Shore A)
Temperature resistance	from -40 to +80 °C	from -40 to +130 °C
Pretreatment	Plasma, Corona or Primer	Plasma, Corona or Primer



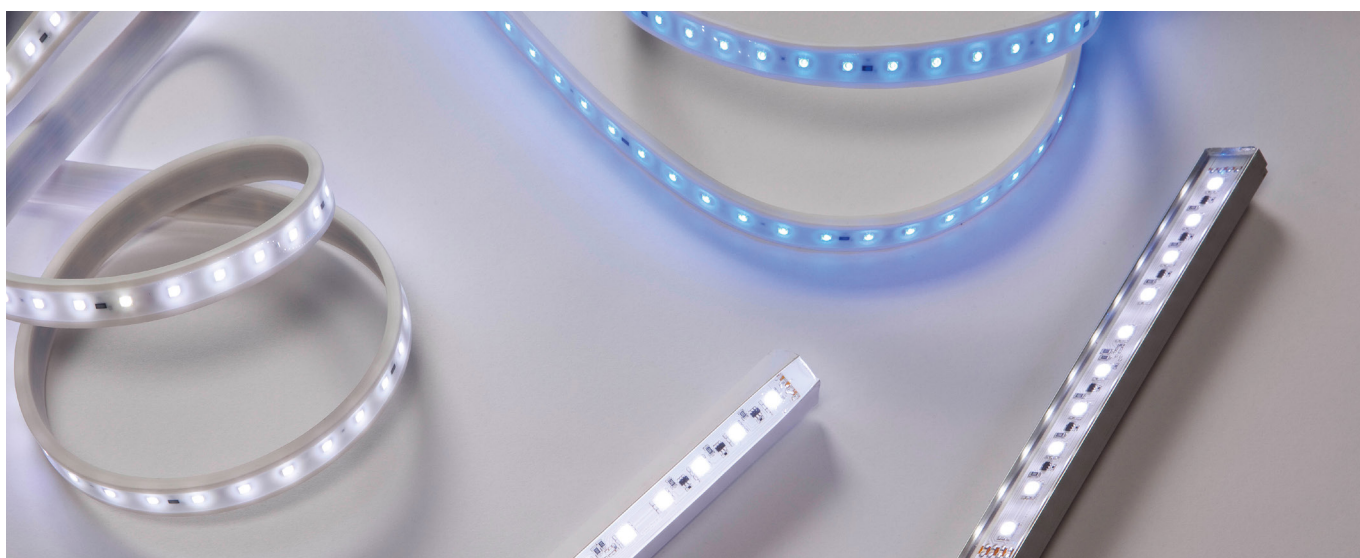
For indoor and outdoor illuminated signs, the LEDs used are often also protected from water, dust and other weathering effects by sealing them with casting resins.



For the fully potted LEDs, our polyurethane potting systems are available in transparent or opaque variants for better light diffusion. The high UV resistance of our clear aliphatic potting systems allows higher light transmission than from transparent plastic covers, which can easily get scratched. Even in a 40-day endurance test at +150 °C, the transparent potting systems still retain a light transmission of approx. 90%.

The flowability, reactivity, hardness grading, density, temperature resistance and flame protection of the 2-component FERMADUR polyurethane potting systems can be specifically adapted to your application.

Potting of LED light fixtures with transparent and translucent FERMADUR



Flexible and fully automatic – according to your requirements

DM 502 mixing and dosing system with 3-axis linear robot and a shuttle table for the parts holder

As process experts, we support you with our application engineering expertise, from the design phase for your components through to fully automated material application using formed-in-place foam gasket (FIPFG) technology. Our flexibly configurable DM 502 mixing and dosing system has a 3-axis linear robot and sliding table solution, and can be adapted to your production concept for the seal-foaming of luminaire housings or for LED potting. To this end, we offer equipment options for semi-automatic or fully automatic production systems. If desired, CNC-controlled plasma application is also possible to achieve surface activation of the housing contour, resulting in better adhesion of the foam gasket to plastics such as PP or PE.

The reference configuration shown here for sealing linear luminaires consists of the DM 502 mixing and dosing system with an LR-HD 3-axis linear robot and the WT 1-LEVEL shuttle table for picking up parts. Two alternately operated pick-up plates facilitate continuous operation by allowing workpieces to be fixed and processed in a single plane. The positioning of the luminaire housings on the pick-up plate is performed either by a machine operator, who can also check the parts for quality, or by a Pick & Place Robot. In the latter case, a camera system can optionally be installed to perform quality control on the parts.

The material components of the sealing foam used are mixed dynamically and homogeneously in the mixing head of the DM 502. The resulting fine-cell foam structure is crucial for low water absorption levels. For material application using the FIPFG process, the MK 825 PRO precision mixing head is moved over the housing groove of the linear luminaire with high repeat accuracy by the CNC-controlled linear robot, and the sealing material is applied into the groove in accurately metered doses via the mixing head nozzle. The dosing loop completes the foam gasket with a seamless, almost invisible coupling point.

Highly efficient and precise material application by the DM 502 allows quick application processes in your production facility, and rapid processing of the parts through to final acceptance.



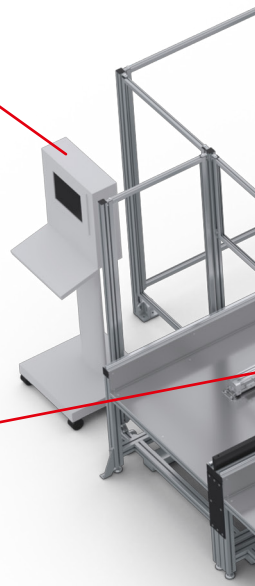
Optionally available: **CONTROL 2 touchscreen operating panel** (21.5") for operating the dosing system



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



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

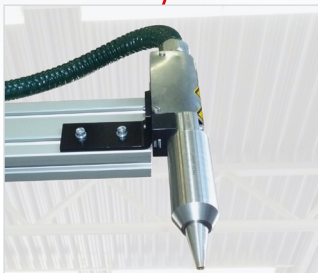
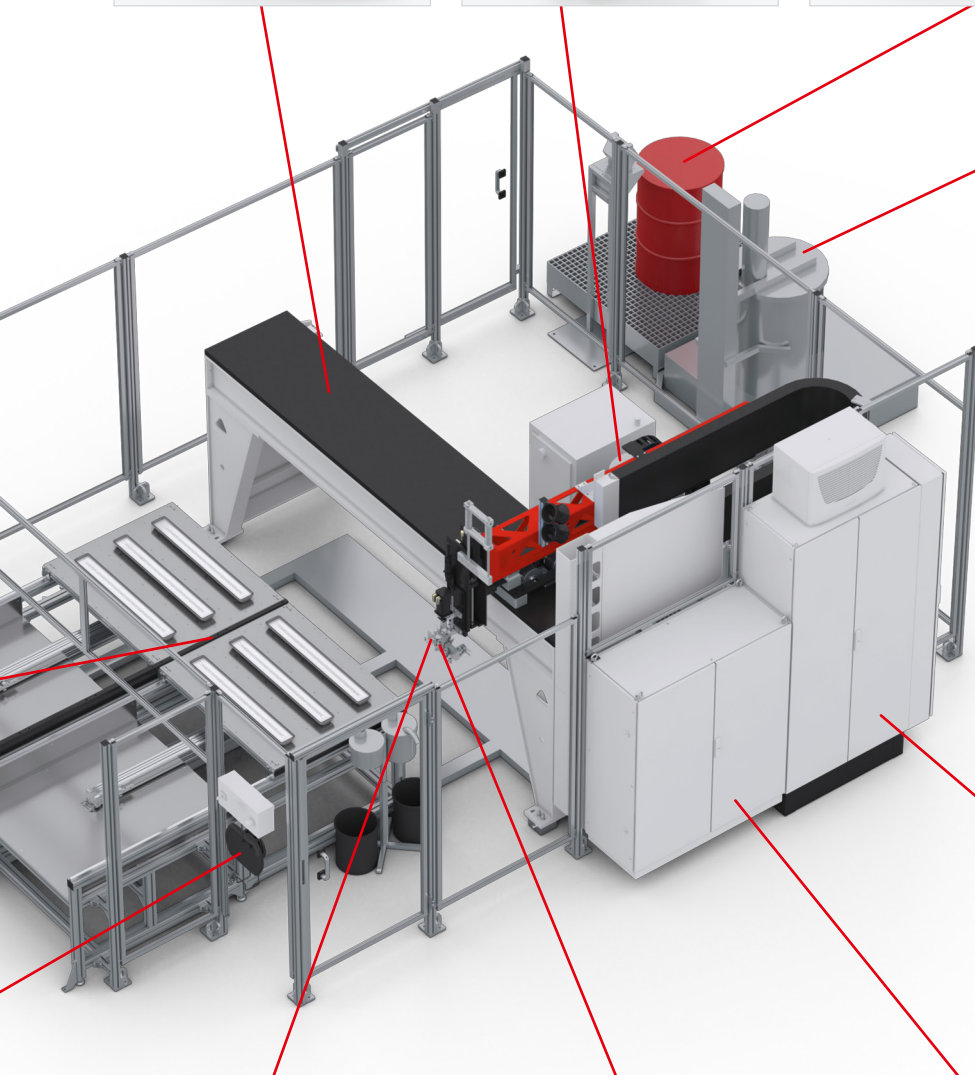
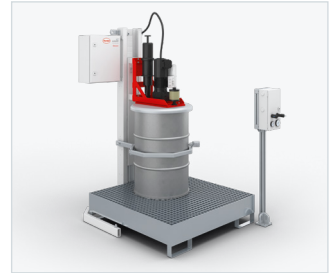


Highly dynamic **LR-HD 3-axis linear robot** for precise guidance of mixing heads for the application of polymer reaction materials. The rack and pinion drive with high stiffness and acceleration enables dynamic application speeds.

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

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

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



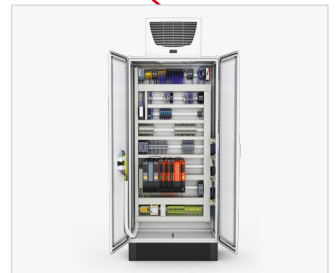
The **plasma nozzle**, optionally mounted on the CNC linear robot, applies the plasma before the seal is applied.



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



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



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

The basic solution for standard applications

Dosing cell for easy handling and high process stability

The reference configuration of the 3E dosing cell shown is a low-pressure mixing and dosing system for two components for the partially and fully-automatic application of sealing foams.

The already compact design of the 3E dosing cell also takes up little space as a result because, as a CE-compliant dispensing cell, it does not require any additional safety fences or light barriers. This is a pre-programmed Plug & Work version that is delivered pre-assembled in a container. As soon as electricity, water and compressed air are connected and the material is prepared in the material pressure tanks, production can begin. The costs of installation and training courses can therefore be kept to a minimum.

The dosing cell can process non-viscous, medium-viscosity and highly viscous material systems based on polyurethane. The application rate is adjustable from 0.5 to 5.0 g/s. Experience shows that this range covers 90% of industrial applications.

The optional shuttle table allows components of different sizes to be processed in a single plane. Continuous operation is guaranteed by the two pick-up plates that can be moved manually in alternation. For larger parts, the two pick-up plates can be connected to form one large sliding table.

The CNC-controlled MK 825 BASIC precision mixing head for two material components applies sealing material into the housing groove of the linear luminaires with contour precision. With the sometimes very narrow and deep grooves, the metering of the sealing foams needs to be very precise. The MK 825 BASIC precision mixing head performs this task with high metering precision and repeat accuracy. The dosing loop completes the foam gasket with a seamless, almost invisible coupling point.

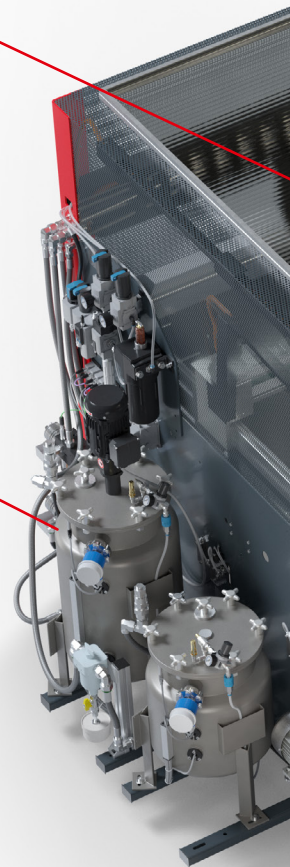
With the CE-compliant 3E dosing cell, an immediate, safe start to production is possible, as well as efficiency-enhancing space and cost savings.



MK 825 BASIC precision mixing head with high-pressure water rinsing



The material pressure tanks have a capacity of 44 l for the A component and 24 l for the B component, thus accommodating the typical asymmetrical mixing ratio.



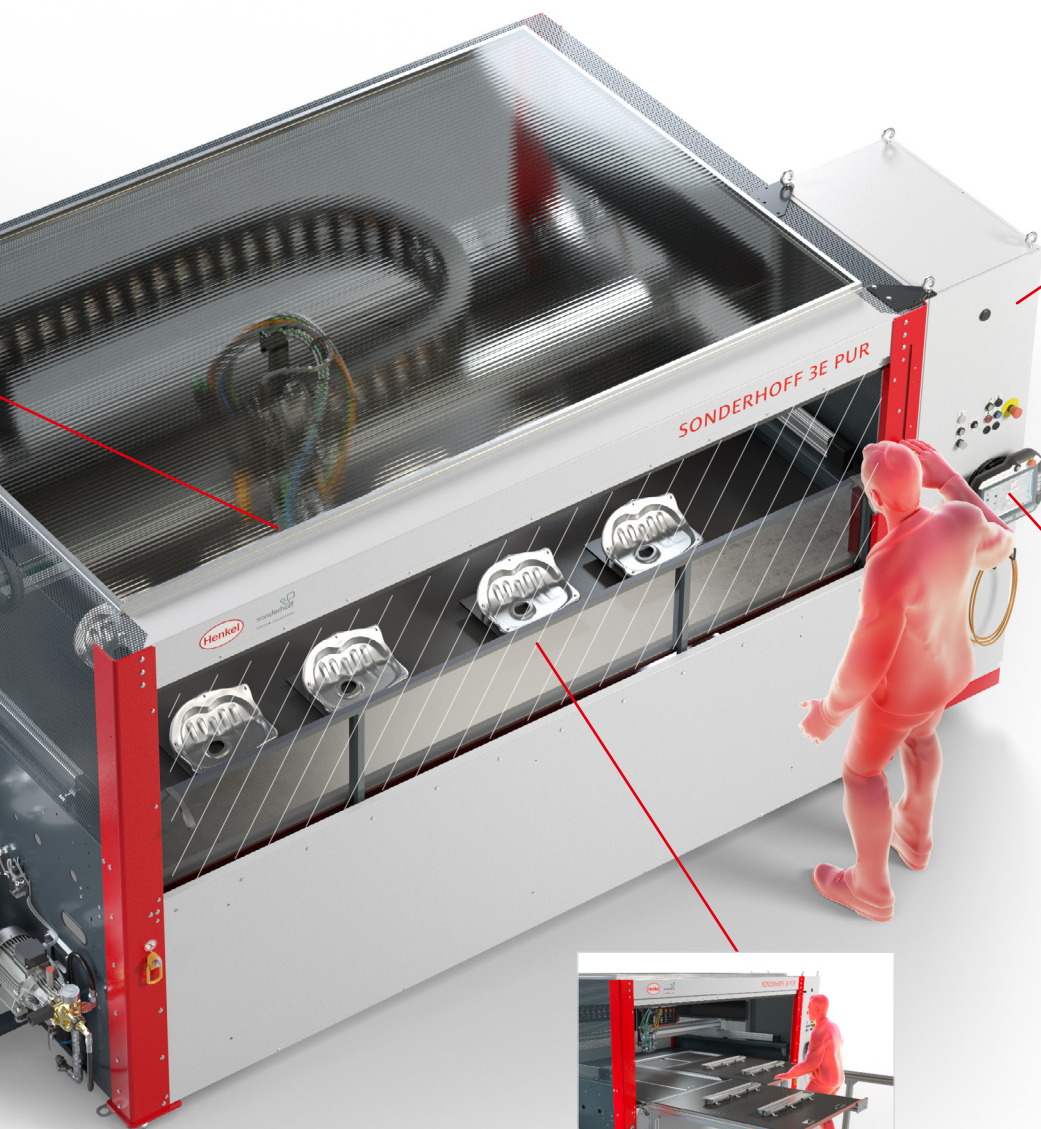
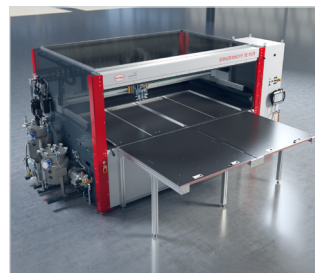
Optional:
Automatic **ELEVATOR** drum refilling station for the **A component** with pneumatic lift and agitator



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



Shuttle table (optional):
Two pick-up plates to be shifted manually in pendulum mode in one plane (can be connected to one pick-up plate for large parts)



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



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



In the standard design, a **manual lifting gate** secures the area between the dosing application and the insertion process. A quotation for an alternative variant with a quick-running system can be provided upon request.

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
- › Harmonized 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
- › More cost effective compared to 2K injection molding, as there are no tooling costs
- › High degree of future viability, due to solution flexibility in a wide variety of industries & applications



Advantages of our mixing and dosing machines

- › Combination of processes (bonding, foaming, potting)
- › High flexibility of the dosing system
- › Simple, intuitive human interface
- › Automatic material preparation incl. handling
- › High dosing and repeat accuracy
- › Short machine downtimes and cycle times
- › Fine-cellular 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 / low visible coupling point
- › Compensation of component tolerances
- › Excellent resilience after compression
- › Multiple compression and recovery processes possible
- › Broad range of properties / wide variety of recipes
- › Individually adaptable formulations
- › 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

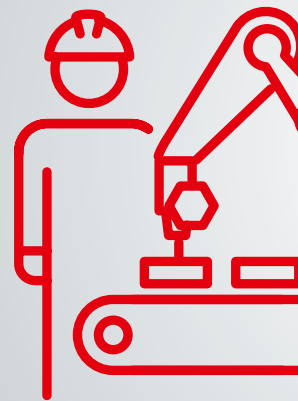
With its Sonderhoff brand, Henkel has not only acquired many years of experience in the manufacturing of tailor-made 2 component sealing systems and mixing and dosing machines, but also process expertise for very precise material application using the FIPFG (Formed-In-Place-Foam-Gasket) technology.

With the Sonderhoff portfolio, we offer our customers 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.

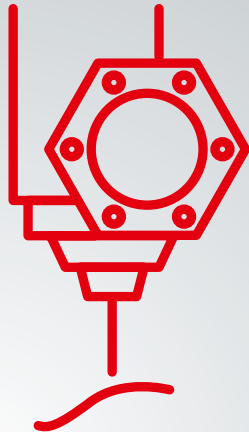
If you would like to take advantage of all the benefits of the FIPFG technology for your production in a flexible, fast, and effective manner, we provide sealing solutions for your components at one of our many contract manufacturing sites worldwide without having to make your own acquisition investments. 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.



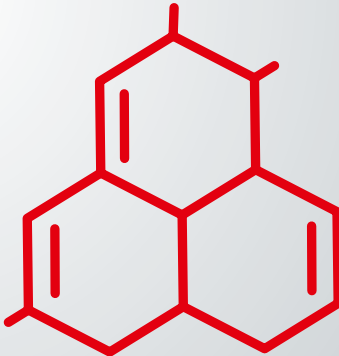
MANUFACT

Flexibility & Precision



EQUIPMENT

Automation Solutions



MATERIALS



MANUFACTURING

Customer-specific solutions – worldwide and for many industries

The Henkel specialists for the Sonderhoff portfolio
are available globally

KOLO, POLAND
External Subcontracting Location

DÜSSELDORF, 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 Henkel's Sonderhoff portfolio. At our Centers of Expertise and Regional Hubs, our specialists offer application engineering advice, e.g. selecting a suitable material system and sampling of your components, as well as project management for dosing systems and automation. You will receive training from us on how to use the FIPFG technology and we will support you with the selection of spare parts and a regular service offering. 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, and potting solutions. We look forward to hearing from you.



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