sonderhoff
SYSTEM SOLUTIONS

MORE THAN
50
YEARS OF
EXPERIENCE IN
SYSTEM SOLUTIONS

SEALING OF PV INVERTER HOUSINGS

Henkel

Closest to the sun

The climate targets, which aim to achieve CO_2 neutrality, are safe-guarding future generations and preserving the viability of our planet as a place for human life. It will be also essential to use natural resources (e.g. wind, hydro and solar power) efficiently to generate renewable energy.

Whether located in stormy coastal location, deserts or Alpine chalets, photo-voltaic (PV) systems to convert solar energy into electrical power and solar thermal plants must run reliably for many years. To provide protection against enormous temperature differences, considerable wind loads, as well as ice and salt water; the toughest requirements are placed on the sealants, adhesives and potting materials.

PV and solar thermal plants are usually designed to have a service life of several decades. In order to ensure that these plants can be used sustainably and run economically, all of their components and functionality have to be designed with this period of time in mind. This is a challenge that many people underestimate.

Are you looking for a single-source supplier of solutions for the sealing of inverter housings and solar thermal plants?

We will provide you with a perfectly coordinated sealing solution, consisting of a sealing foam that satisfies your requirements and a dosing system for high-precision, fully automatic material application, controlled by contour robots.

Do you require a flexible automation system that can be variably adapted to your production conditions?

The modular design of our mixing and dosing systems with their peripheral interfaces allows flexible and efficient use and excellent integration into existing production concepts. In addition, these systems are very easy and intuitive to operate offering highly dispensing accuracy and system process monitoring.

We offer you reliable sealing, bonding and potting solutions. These include application engineering advice, material systems with a broad range of characteristics as well as the matching dosing technology and process automation.

Inverter housing for PV modules with a polyurethane foam gasket in the 3-dimensional housing groove

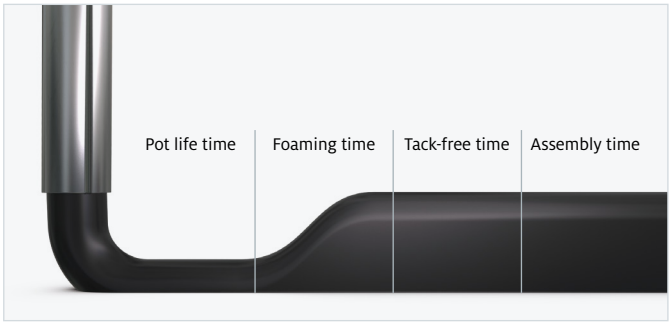
Tailored material systems for maximum product safety

We carry out developments individually for your specific requirements

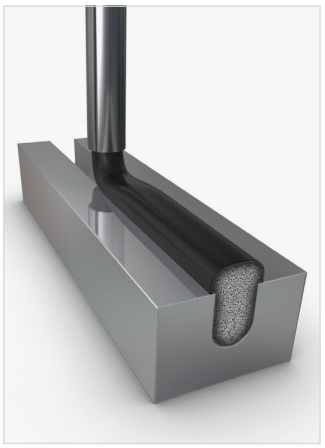
Henkel offers its customers many years of experience gleaned from a wide array of applications deployed for the photovoltaic (PV) industry. In photovoltaic and solar thermal applications, once installed many components and modules have to be so tightly sealed that there is no chance of moisture, dust or harmful media penetrating the housing or temperature-related factors causing any detrimental effects.

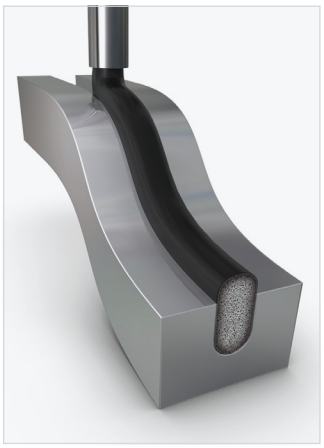
Our polyurethane-based, 2-component FERMAPOR K31 sealing foams have been specifically designed to meet the stringent standards required by photovoltaic systems and seal photovoltaic inverter housings against moisture ingress and temperature effects. The electronics within the inverter housing are therefore optimally protected against humidity and corrosion. Sealing foams with different viscosities permit dosing application on flat surfaces, as well as on 3D contours.

If PV inverter housings have to opened for maintenance purposes and re-sealed, it is essential that the polyurethane foam gasket has very good shape recovery characteristics. As a result, the mixed-cell foam structure can still be compressed easily even after many years (verified in accordance with DIN EN ISO 1856) and the foam gasket retains a consistently high level of impermeability. A potential compression rate of between 30% and 60% (according to the hardness of the material system) allows for the compensation of component tolerances. The foam can be made harder or easier to compress by adjusting its degree of hardness.



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





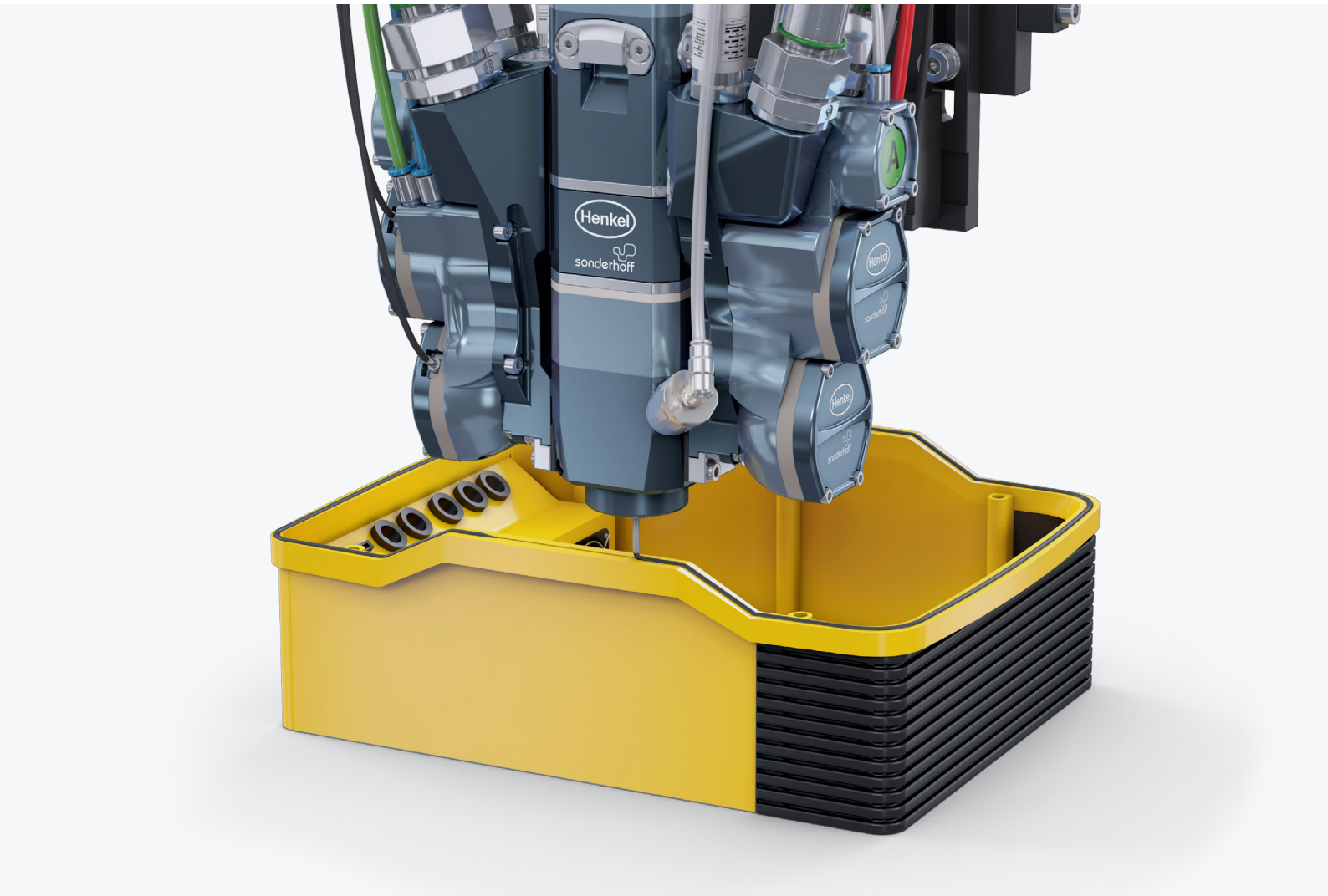
FERMAPOR K31-	A-9675-2-VP B-4	A-9230-2-VP B-4
Mixing ratio	4 : 1	4.5 : 1
Pot life time	38 sec.	50 sec.
Tack-free time	3.5 min.	8 min.
Viscosity of the A component	1,800 mPas	50,000 mPas
Density of the foam	0.34 g/cm³	0.29 g/cm³
Hardness (Shore 00)	64	62
Temperature resistance	from -40 to +80 °C	from -40 to +80 °C

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

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

Besides protection against the ingress of moisture, dust and dirt, PV and solar thermal plants also above all require very good high temperature resistance.

The terminal box of a photovoltaic system contains sensitive electronics and must not suffer an outage – even under extreme weather conditions. FERMAPOR K31 sealing foam systems generally meet the component requirements for resistance to high temperatures and UV exposure and also comply with IP 67 (IP = ingress protection).



Flexible and fully automatic – fully in line with your requirements

Mixing and dosing system with 3-axis linear robot and a shuttle table for picking up parts

As process experts, we support you with tailored advice for the automation of your manufacturing processes. We offer numerous configuration and equipment options for semi-automatic or fully automatic production systems, either with the 3-axis linear robots or through the use of 6-axis robots.

The reference configuration shown here for sealing the housings of photovoltaic inverters consists of the DM 502 mixing and dosing system with the LR-HE plus 3-axis linear robot or, alternatively, LR-HD and the WT 1-LEVEL shuttle table for picking up parts. The two pick-up plates working in continuous shuttle mode enable workpieces to be picked up and processed in one plane. The positioning of the housings on the shuttle table top is performed by a machine operator, who can also check the parts for quality, or by a Pick & Place Robot.

Seamless sealing of the PV inverter housing is ensured by the precise processing and true-to-contour application of foam using the DM 502 mixing and dosing system. The CNC-controlled MK 825 PRO precision mixing head applies the 2-component polyurethane foam system within the groove of the inverter housing with high dosing precision and repeat accuracy. After the dosing cycle, the material undergoes a room-temperature curing process. A soft-elastic polyurethane foam gasket with an almost invisible coupling point forms as a result.

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

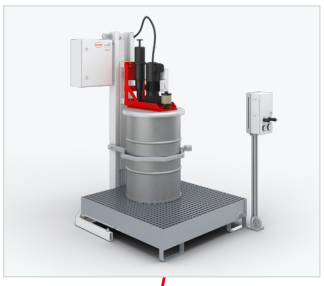
MK 825 PRO precision mixing head
with high-pressure water rinsing

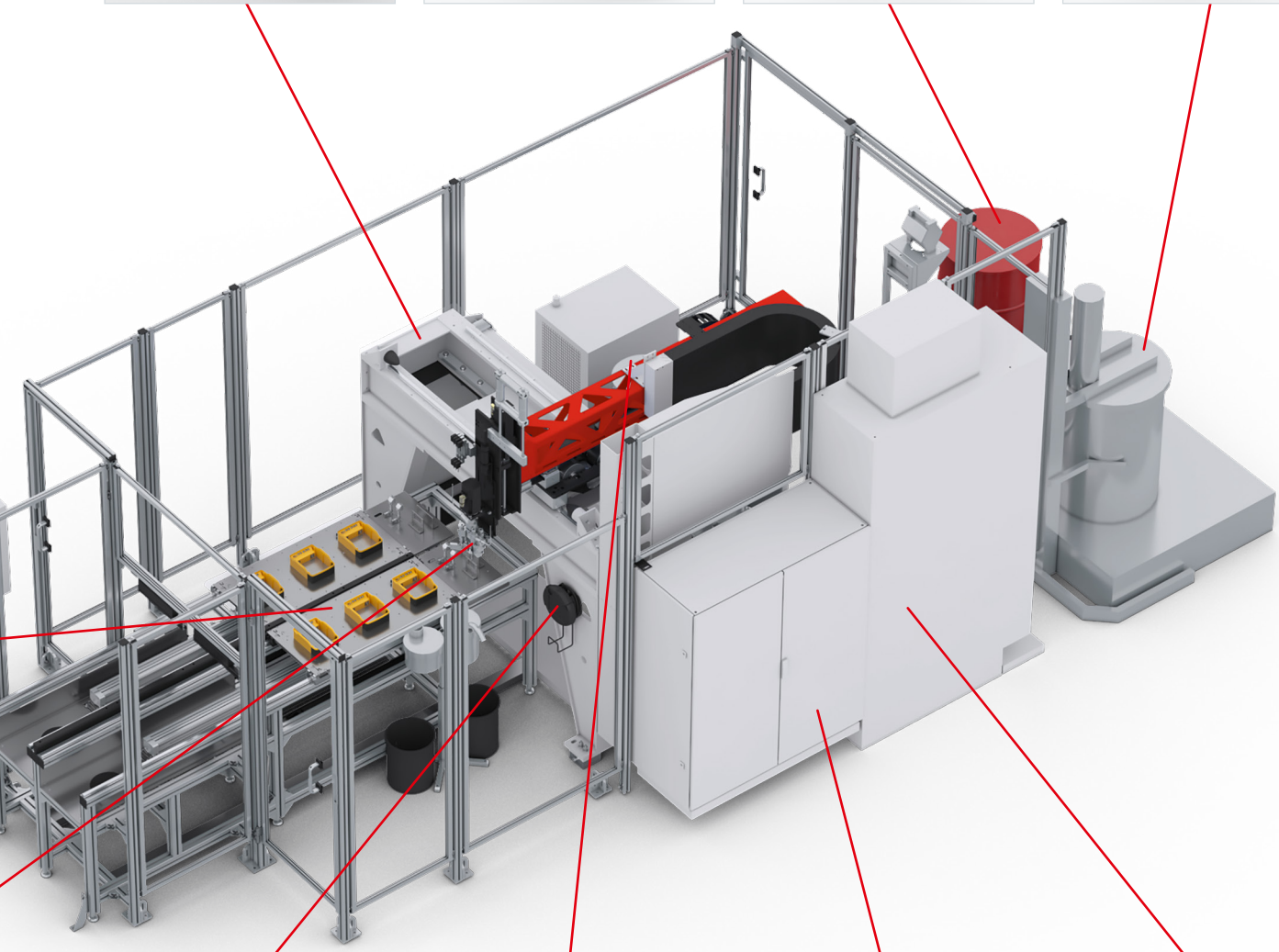
Highly efficient **LR-HE plus 3-axis linear robot** for precise guidance of mixing heads for the application of polymer reaction materials. The Omega toothed belt drive enables high application speeds for components with medium and large radii.

Optional: 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.

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

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.

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

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.

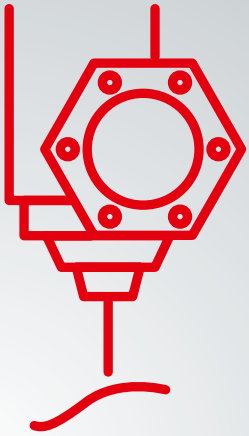
With the dosing technology that is tailored to our sealing foams, we ensure efficient production processes in accordance with the requirements of fully automated series production.

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

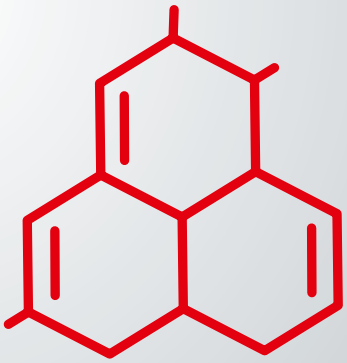
Flexibility & Precision



EQUIPMENT

Automation Solutions

URING



MATERIALS

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 sys- tem 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. Further- more, 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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