

SEALING OF CAR DOOR MODULES



Car door modules, waterproof and low-vibration

The car door has undergone a long period of development: from the simple foil seal of a bodysell door and the integration of a few mechanical components, to the idea of a multi-unit carrier developed by leading OEMs. The so-called AGT door module is manufactured as a galvanized stamped sheet or, increasingly, from fiberglass-reinforced plastic, with recesses for the incorporation of electronic and mechanical units.

The car door is no longer just the barrier that represents a dry seal which protects the interior of the car from the wet exterior. On the contrary, the door module incorporates various forms of technology and electronics from the fields of safety, infotainment, lighting and air-conditioning. Drivers and passengers no longer would like to do without these features.

The contours of the AGT door modules and the units mounted on them, such as electric window controls, loudspeakers, door locks, etc., are sealed by our polyurethane foam gaskets and therefore protected against water and dust from the outside. The seamless foam gasket of the AGT module is the water barrier between the wet and dry sides of the door shell. Furthermore, the foam gasket dampens noises and vibrations that occur when the vehicle is being driven.

The leading automotive suppliers have placed their trust for years in our Formed-In-Place Foam Gasket (FIPFG) dosing technology and wide selection of innovative material systems for sealing car door modules.

Are you also not satisfied until you have found the optimal and most flexible solution for your production? We are not satisfied until you are. This is the reason why our machine solutions focus on a dosing system which is very flexible and can be integrated into existing production concepts based on its modular construction.

Do you ask yourself how you can make your production processes more efficient with large quantities and short cycle times? We offer very reliable plant engineering with minimized maintenance intervals for your technical and commercial challenges.

As a result, you are provided with stable dosing processes for sealing foams with a high degree of precision and output efficiency, low material consumption and consistently high dosing quality from us as process experts in the field of FIPFG technology.



Customized sealing foams for seamless sealing of door modules

We develop customized solutions for your specific requirements

The unit carriers of car doors are predominantly made of galvanized steel, aluminum or, increasingly, fiberglass-reinforced plastic.

Medium- to high-viscosity polyurethane sealing foams are used to seal the door module contours on a flat application surface or in a shallow groove. The dosing application is carried out fully automatically and very accurately with respect to the contours by means of the FIPFG technology of our mixing and dosing system. The foam gasket on the entire module contour forms a seamless seal with a barely visible coupling point.

Our polyurethane foams provide good adhesion on galvanized surfaces of carrier metal sheets. Adhesion to fiberglass-reinforced plastic often requires pretreatment with plasma.

Due to the high level of impermeability offered by the foam gasket of the door module, which is compressed during installation, the car interior is separated from the weather outside. The electrical components on the door carrier are protected against water spray and dust. The seal also protects against rattling caused by the vibrations generated during driving.

The variably adjustable elasticity of the foam offers advantages with regard to low installation forces, during the assembly of the AGT door module and the mounting of electromechanical units on it.



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



The dosing application can be carried out on a flat surface or in a groove.

	Door module with groove	Door module without groove
FERMAPOR K31-	A-3520-4-G-FC	A-4657-1-G-FC
	B-17-FC	B-17-FC
Mixing ratio	4.1 : 1	4.5 : 1
Pot life time	27 sec	32 sec
Tack-free time	5 min.	3 min.
Viscosity of the A component	24,000 mPas	60,000 mPas
Density	0.17 g/cm ³	0.22 g/cm ³
Hardness (Shore 00)	40	46
Temperature resistance	from -40 to +80 °C	from -40 to +80 °C
Pretreatment	Plasma for e.g. PP and PE	Plasma for e.g. PP and PE



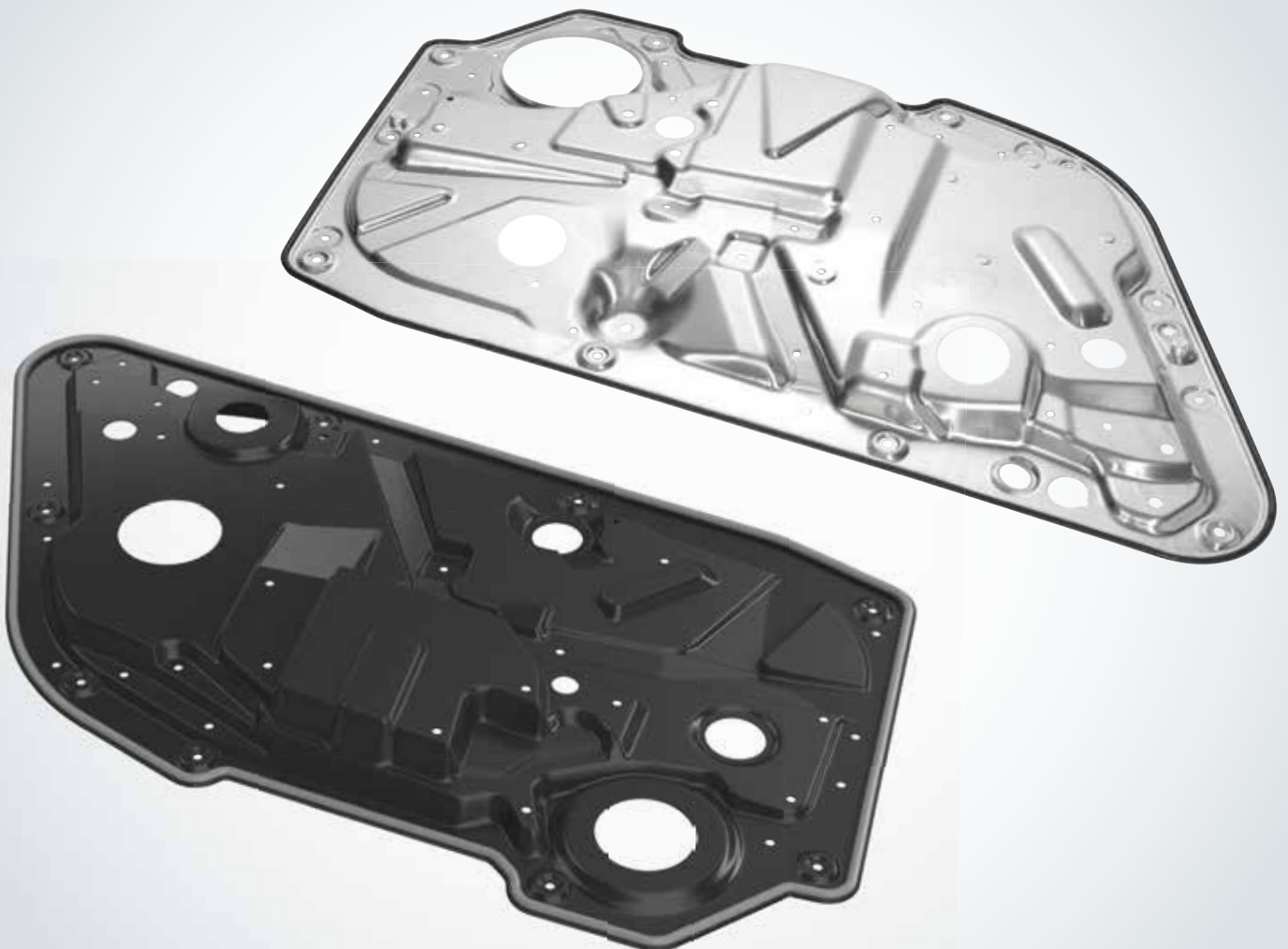
The unpressed polyurethane foam gasket before installation.



Pressing the foam gasket achieves the required degree of tightness in the installed condition.

The very good resetting ability provided by the foam gasket allows the repeated removal and reinstallation of the door module or the components mounted on it for repair purposes in the event of damage, without any reduction in the degree of tightness.

The use of fast-reacting and curing 2-component sealing foams enables short application processes and the rapid processing of parts in your production until the final acceptance of the AGT door modules.



Flexible and fully automatic – fully in line with your requirements

Mixing and dosing system with two 6-axis robots and plasma station,
as well as a conveyor belt for the efficient feeding of the materials

We support you with our application engineering expertise from the design phase of your AGT door modules to fully automated material application using Formed-In-Place Foam Gasket (FIPFG) technology. With the usually high volumes of parts and process speeds, an important success factor for the efficiency of our overall solution is the optimal integration into your manufacturing processes. As process experts, we work together with you to develop your individual automation solution according to your requirements. To achieve this, we offer various configuration and equipment options for semi-automatic or fully automatic production systems.

In the illustrated reference configuration of the DM 402 mixing and dosing system, two 6-axis robots are used. These take over the handling of the parts in alternating cycles, from the transfer to the plasma station and then to the dosing station, until they are placed on the outfeed conveyor. At the start of the process, robot 1 takes over the door module from the parts holder of the transfer station, before positioning and moving it under the plasma nozzle. Here – in order to improve the strength of adhesion of the foam gasket – the surface of the door module contour is activated with atmospheric pressure plasma.

The robot arm then moves the door module under the mixing head, mounted on the traversing unit, for contour-accurate dosing of the sealing foam. In this process, the material is applied with a high degree of dosing and repeat accuracy into the shallow groove or onto the flat door module contour. The coupling point of the foam gasket closes seamlessly and is almost invisible.

At the same time, robot 2 picks up the next door module from the transfer station. In the closely timed production cycle, robot 1 has already placed its part on the transfer belt for clocking out and starts the new process with the next part.

The material components of the polyurethane foam used are mixed dynamically and homogeneously in the mixing head of the DM 402. The resulting fine-cell foam structure is crucial for low water absorption. When installed, the uniform compression of the seamless foam gasket produces a consistently high level of tightness over the entire contour of the AGT door module.



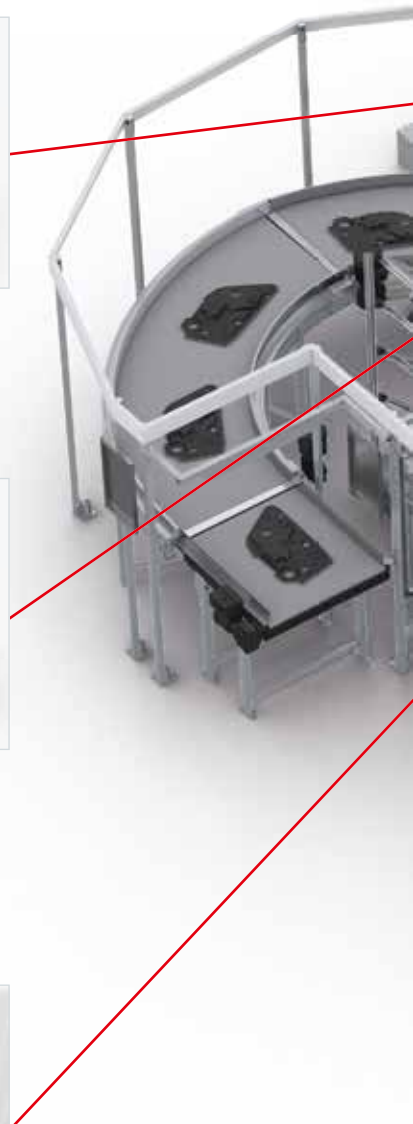
Automatic **drum refilling station SUPPLY TAP** for low-viscosity products, e.g. isocyanates (**B component**)



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



Surface activation through atmospheric plasma to improve adhesion. The optional **plasma nozzle** can be installed either on the back of the Y-axis or parallel to the mixing head with a lifting unit.



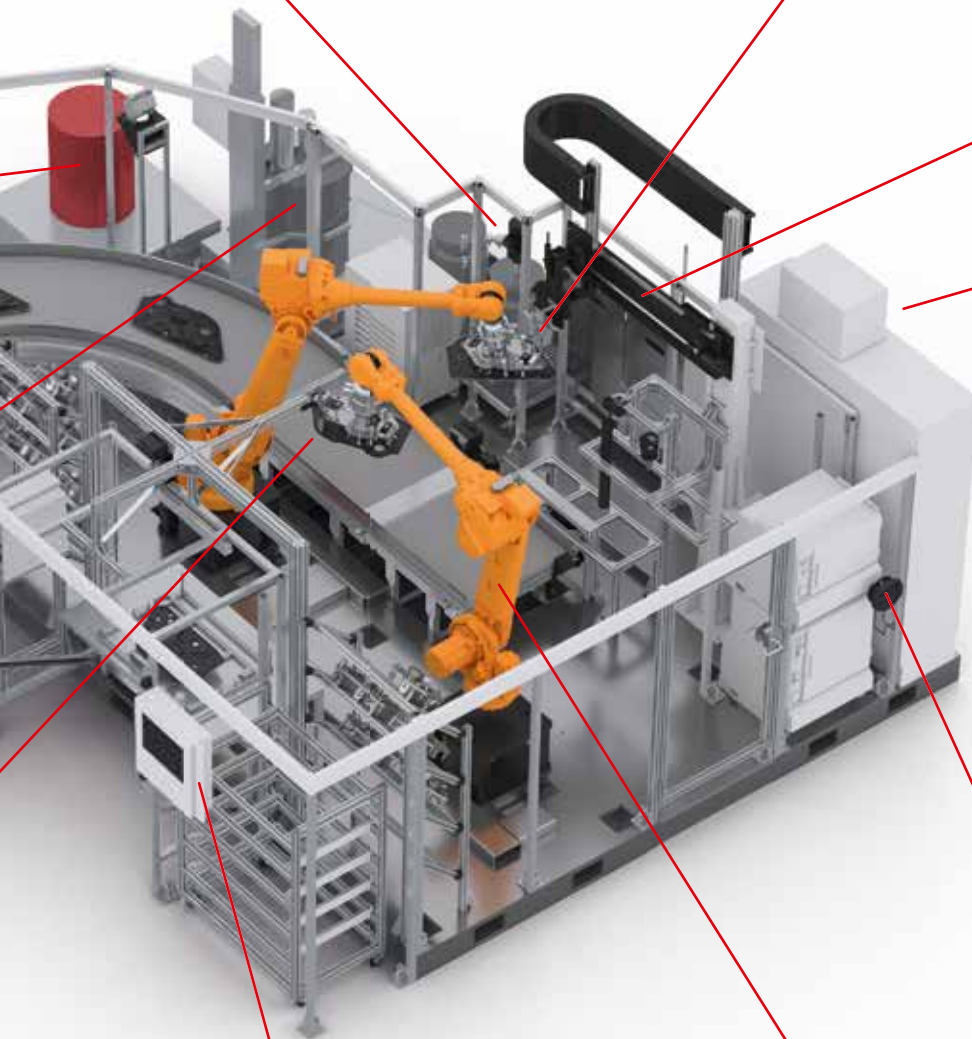
Material pressure tanks (24 l or 44 l, single-walled or double-walled) with minimum level sensors, on a grating platform with adjustable leveling feet and drip tray



MK 625 precision mixing head with high-pressure water rinsing



2-axis mixing head traversing unit for the precise positioning of mixing heads for the application of polymer reaction materials – optionally available with an electric or pneumatic drive.



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



The **dosing machine cabinet** contains the components of the dosing periphery, such as the dosing pumps.



The optional **Touchscreen control panel** (15") enables convenient operation of the dosing system.



The **6-axis robot** guides the component under the mixing head for contour-accurate dosing application of the foam gasket.



The multifunctional **Mobile Panel** (10.1" WXGA TFT) enables convenient operation of the dosing system.



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
- › 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-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
- › Excellent resilience after compression
- › Multiple compression and release 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 HBF to HF-1
- › 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 2-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 our Sonderhoff System Solutions (S3), 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, 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. The spectrum of capabilities ranges from the sampling of prototypes and small batch series to production scale manufacturing.

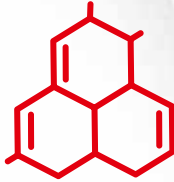
The choice is yours! You can either decide in favor of our all-inclusive package, consisting of material, machine and contract manufacturing, supported by application advice, sampling and training or you can choose the individual solutions that suit you best. We network our products and services from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



Flexibility & Precision



EQUIPMENT



MATERIALS



SUBCONTRACTING

Customer-specific solutions – worldwide and for many industries

The Henkel specialists for the S3 portfolio are available to you globally

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 Henkel's S3 portfolio. At our "Centers of Expertise" and "Regional Hubs", the S3 specialists offer application engineering advice on the selection of a suitable material system and sampling of your components as well as project management for dosing systems and automation. We can offer training on how to use the FIPFG technology. We will also 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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