

BONDING OF AUTOMOTIVE DISPLAYS



Precision bonding of automotive displays while compensating for dimensional tolerances

The digitization of the car for modern mobility requires interfaces that offer a more individualized and interactive approach to road users. With increased development of self-driving vehicles, multidimensional infotainment and safety functions are required to accommodate networking. In addition to creating a comfortable cockpit environment, automotive displays support driver safety by providing up-to-date information about traffic events and car functionality.

Automotive infotainment systems provide audio or video entertainment for all occupants via their displays. Advanced driver-assistance systems (ADAS) provide graphical visualization of driver information such as parking assistance, navigation, traffic assistance, control functions and internet connectivity. All setting options in the car can be operated via touch displays.

Freeform and curved automotive displays are the future, enabling larger and more attractive dashboard displays. Housing designs are evolving to better utilize interior space and accommodate these larger and more responsive screens.

Our solutions for structural bonding of automotive displays meet the needs of market trends, such as the increasing demand for design flexibility. High-precision metering with Henkel's fully automatic mixing and dosing systems ensure high contour accuracy during adhesive application.

How do you ensure perfect display bonding when cost and design considerations are increasingly narrowing the bonding surfaces of the display housing?

What can you do to compensate for component tolerances during adhesive application, so as to achieve an adhesive bead of uniform width after joining?

We provide the solution for you, with Active Quantity Adjustment (AQA). This method makes it possible to adapt the dosing quantity during application of the adhesive to the part contour. This compensates for production-related differences and irregularities in the bonding surfaces as well as applies a precisely calculated and accurately metered quantity of adhesive. To achieve this, a 3D line scanner measures the part geometry and compares the data with the previously defined CAD reference of the part before the adhesive is dispensed. The result after joining is an adhesive seam that is consistent in height and width.



Strong adhesive bonds on narrow bonding surfaces

Very fast curing 2-component adhesives for high initial strength

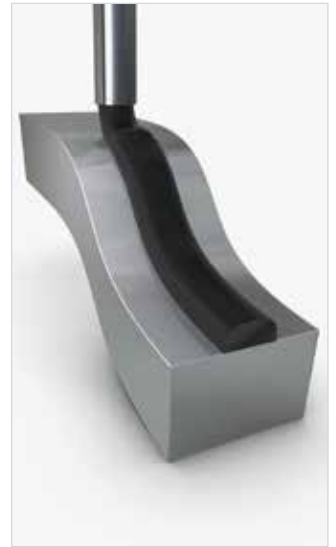
Freeform and curved automotive displays designs dominate the interiors of modern cars. They are fully integrated into the overall interior design.

The design and manufacture of automotive displays requires a variety of material features, ranging from ensuring the strength of the display housing structure to bonding the cover glass onto the TFT / LCD display.

For bonding the automotive display to the housing, structural 2C adhesives based on MS polymer and silicone are used for elastic bonding with high / medium strength. They are suitable for the multi-substrate bonding of freeform and curved display designs. This can include the bonding of different substrates, such as plastic to plastic; plastic to glass; and glass to glass. Thanks to its very fast curing properties, the adhesive used achieves a high initial strength at room temperature shortly after the components are joined.



Adhesive application on a 2D surface



Adhesive application on a 3D surface



Display housing with adhesive bead before attaching the transparent cover



Cross section of the display housing after joining



Application of adhesive bead onto three-dimensional display housing with MK 600 mixing head

The trend towards larger displays in vehicles, combined with the need for space-saving installation, has led to narrow-edged display solutions. The challenge is to still achieve strong adhesive bonding with narrow bonding surfaces and thus thin bonding lines. The adhesive must not protrude at the edges once joining the display to the housing. Fully automatic adhesive application and tolerance compensation are handled by Henkel's mixing and dosing systems.



Display after bonding is completed

Flexibly adjustable dosing quantity for compensation of component tolerances

Active Quantity Adjustment (AQA) for automatically adjustable adhesive application even at different robot speeds

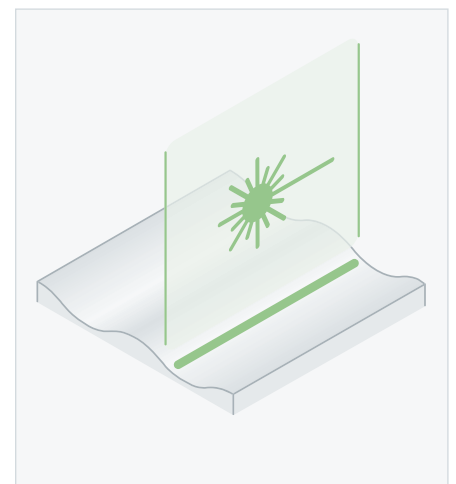
With the Active Quantity Adjustment (AQA) process developed by Henkel, it is possible to control the amount of adhesive dispensed for bonding displays to the housing. This ensures the correct quantity dosage at all times based on the respective height profile of the component.

This method makes it possible to adapt the dosing quantity during application of the adhesive to the part contour. This compensates for production-related differences and irregularities in the bonding surfaces as well as applies a precisely calculated and accurately metered quantity of adhesive.

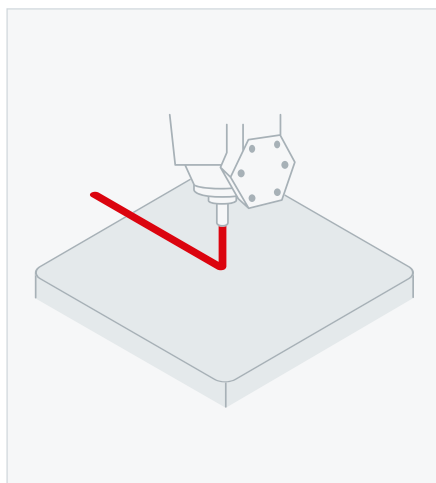
Before dispensing, a 3D line scanner scans the geometry of the components. The scanned data are transmitted to the dosing machine's programmable logic controller (PLC) and compared with the predefined CAD reference of the component. Any deviations detected are used to adjust the dosing program in advance for the next adhesive application.

Wavy unevenness of the bonding surfaces can occur during the injection molding of the display housing. In order to compensate for this, the robot travels more slowly over slightly recessed application areas so that more adhesive is applied there, and travels faster over the slightly raised areas so that less adhesive is dispensed there.

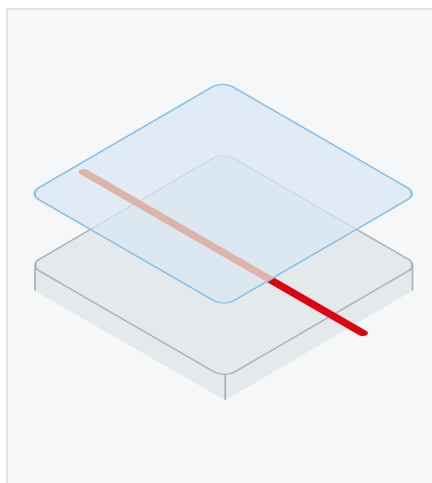
The AQA process can compensate for differences in the dimensional tolerances of the component. With a target glue gap of 1 mm, the specified tolerance for pressing the glue line is ± 0.5 mm when the display and the housing are joined. Since cost and design factors are increasingly resulting in narrower bonding edges of display housings, the AQA process ensures that the adhesive trace on the contour, despite possible dimensional tolerances, remains uniform after the display glass is attached.



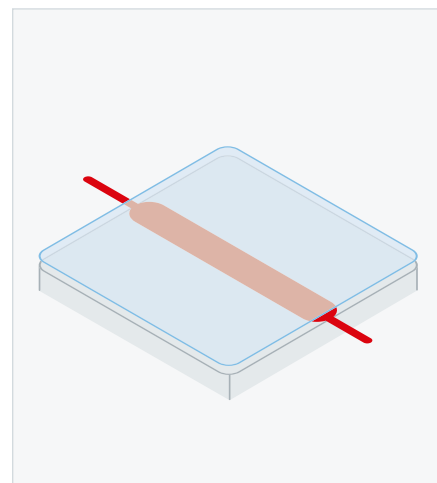
A 3D line scanner records the height profile of the component and transmits the data to the dosing system control.



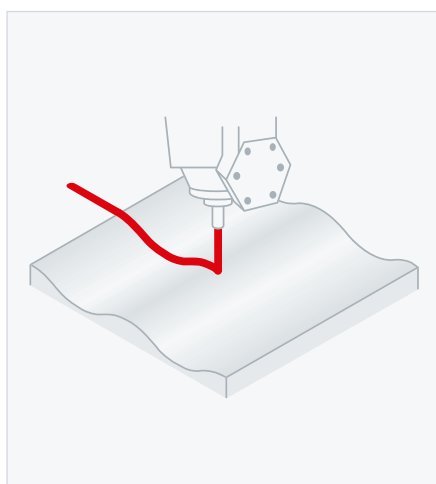
Application of adhesive bead onto absolutely flat surface (ideal condition without component tolerances)



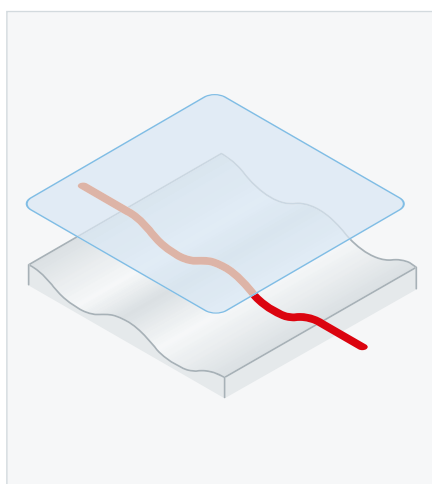
Adhesive bead before joining



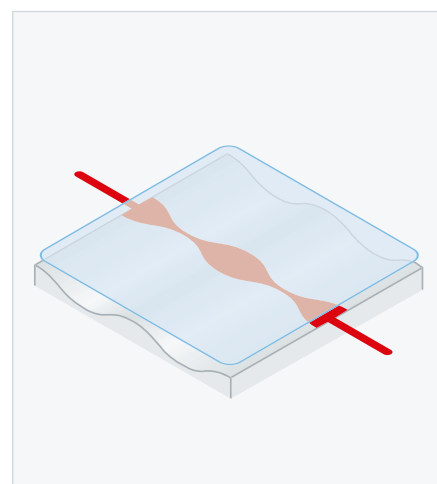
Adhesive bead after joining shows uniform compression of the adhesive



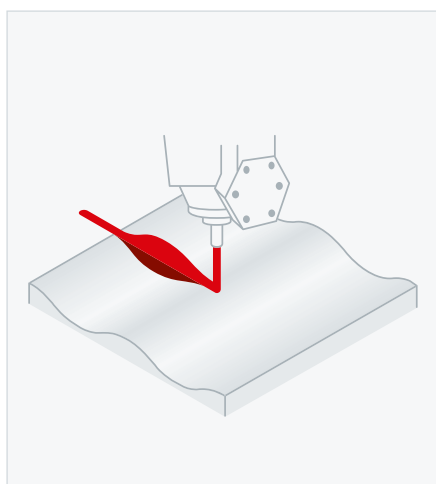
Application of adhesive bead onto component with height tolerances



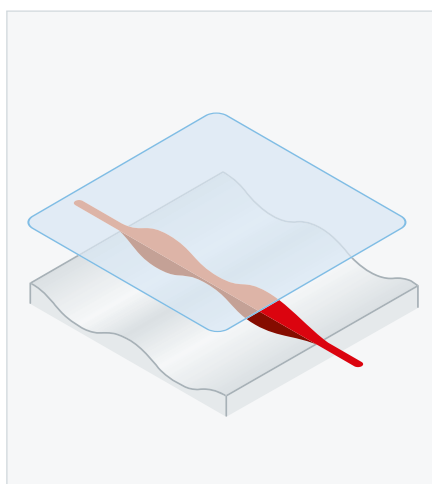
Adhesive bead before joining



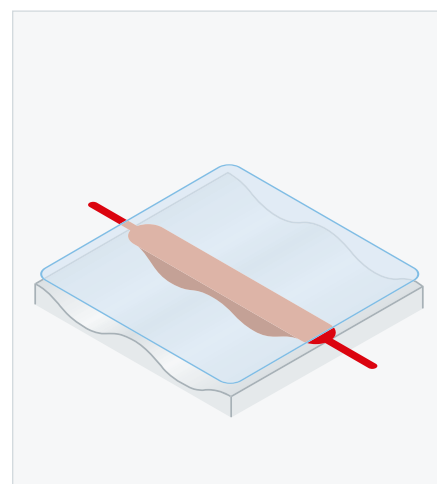
Adhesive bead after joining shows different dimensioning. The aim is to achieve uniform width after compression.



Application of adhesive bead onto component with height tolerances. Utilizing the height profile, the amount of material in each area is adjusted.



Adhesive bead before joining shows application of different quantities based on height profile.



Adhesive bead after joining shows the desired width after compression.

Efficient and fully automatic – to meet your exact requirements

Mixing and dosing systems with 6-axis robot and shuttle table for bonding display housings

In the reference configuration shown, the fully automatic adhesive application process for bonding the automotive displays to the housing is carried out using the DM 502 mixing and dosing machine with a 6-axis robot guiding the MK 825 PRO precision mixing head and the WT 1-LEVEL shuttle table. The display housings are attached to the two pick-up plates, and are positioned within range of the robot in shuttle mode utilizing a single plane. This ensures a continuous adhesive application process. Depending on the plastic used in the display housing, it may be necessary to apply plasma to the housing contour beforehand in order to achieve an improved adhesive effect. For this purpose, the robot can optionally be equipped with a plasma nozzle.

To check and measure part tolerances of the display housing, a separate pre-dispensing process step scans the surface of the housing contour using a 3D line scanner. The measured data are transmitted to the dosing system's programmable logic controller (PLC) and compared with the predefined CAD reference of the component. The detected deviations are used to adjust the dosing program in advance for the next adhesive application.

The mixing head mounted on the robot arm moves over the contour of the display housing and applies a precise, narrow bead of adhesive to the contour. Thanks to the AQA process, it is possible to automatically adjust the adhesive discharge quantity to match the dimensional deviations of any component tolerances.

Wavy unevenness of the bonding surfaces can occur during the injection molding of the display housing. In order to compensate for this, the robot travels more slowly over slightly recessed application areas so that more adhesive is applied there, and travels faster over the slightly raised areas so that less adhesive is dispensed there.

The result is a bead of adhesive that compensates for the height tolerances and will remain consistent after the display glass is joined to the housing.



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.

MK 825 PRO precision mixing head with high-pressure water rinsing or alternative component rinsing system



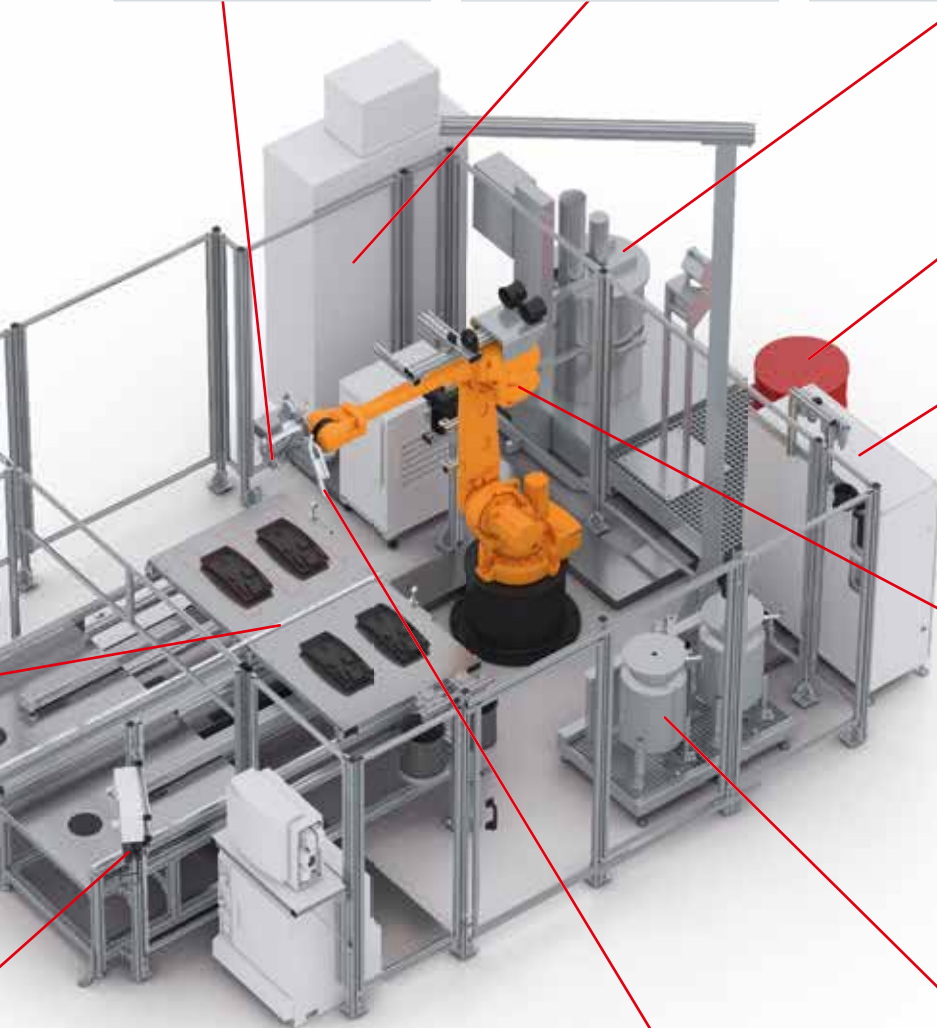
The control electronics, safety engineering and industrial PC are installed in the **control cabinet**.



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



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



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



The **6-axis robot** guides the mixing head precisely over the contours of the component during the dosing process.



The optional **plasma nozzle** mounted on the robot arm applies the plasma parallel to the seal application on plastic surfaces of the component in the same contour.



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



This is why you should use our dosing system technology in your production process



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 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 / low visible coupling point
- › Compensation of component tolerances
- › Excellent resilience after compression
- › Multiple compression and release processes possible
- › Broad range of properties / wide variety of formulations
- › 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

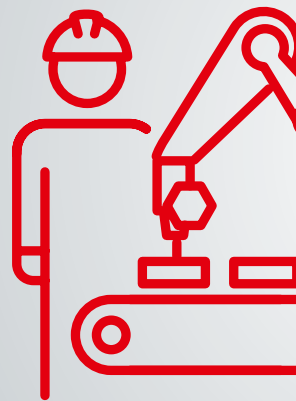
With its Sonderhoff brand, Henkel has not only acquired many years of experience in the manufacture of tailor-made two-component sealing, bonding and potting systems, as well as mixing and dosing machines, but also as a process expert for application-specific material application using the FIPFG (Formed-In-Place-Foam-Gasket) 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, adhesives, and caulking and potting systems, we ensure efficient production processes in accordance with the requirements of fully automated series production.

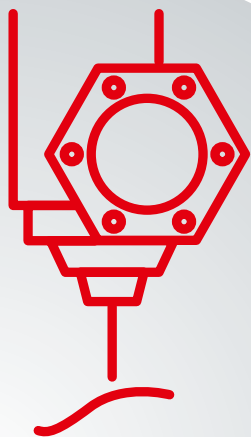
If you would like to take advantage of all the benefits of the FIPFG technology for your production in a flexible, fast, uncomplicated manner and without having to make your own acquisition investments, we can provide expert sealing, bonding, caulking and potting for your components at one of our contract 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.



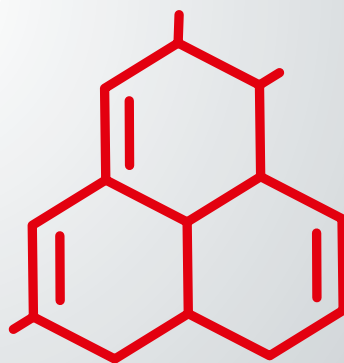
MANUFACT

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

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LONDON, GB

External Subcontracting Location

COLOGNE, GERMANY

Center of Expertise

ELGIN, ILLINOIS, USA

Regional Hub

RICHMOND (KANSAS CITY), USA

Regional Hub

DORNBIRN, AUSTRIA

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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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