



GENERALGUIDELINE

Bonding and Sealing with 1-component Sikaflex®

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THIS DOCUMENT IS VALID UNTIL END OF MARCH 2030 UNLESS SUPERSEDED

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Corporate / English

1 PURPOSE AND SCOPE

The quality and, thus, the service life of an adhesive bond or seal is determined by several factors. In addition to using the right product and correct joint design, the most critical steps are adequate surface preparation and professional processing of the products.

This guideline contains information and recommendations on how to apply Sikaflex® 1-component adhesives and sealants in industrial applications. It must be read in conjunction with the most actual Product Data Sheets, Pre-treatment Charts and, if available, application or working instructions. Due to the different chemical compositions of various Sikaflex® sealants and adhesives, this guideline contains only general information.

If you have any questions or uncertainties, always contact your local Sika company (www.sika.com). Our experts will be happy to advise you on your projects.

Readers of this document may also read the standards EN ISO 21368 (general industry) and EN 17460 (rail stock building). Depending on the country and field of activity, further standards may be relevant.

2 SAFETY INSTRUCTIONS

Always observe the instructions for safe use when working with adhesives, sealants, and other chemical products. For detailed information on correctly handling the products mentioned in this document, refer to the current local Safety Data Sheets and Product Data Sheets.

3 SYMBOLS USED IN THIS DOCUMENT



Important information for the correct use of the product. Read always before using the product.

4 DEFINITIONS

The Sika products referred to in this guideline are available in different series. These are described below. Note that this is indicative information only. Consult the current Product Data Sheet and Safety Data Sheet before using any of the products from the series described below.

Series	Description (typical characteristics for information only)	Example
Sika® Cleaner	Mostly solvent based liquids to remove contaminations such as fingerprints, oils, grease or dust. Cleaners normally leave no residue on the surface.	Sika® Cleaner P Sika® Remover-208 Sika® Cleaner G+P
Sika® Aktivator	Solvent based liquids containing adhesion promoters that chemically react with the surface and change the surface energy. The solvents in activators also remove light contamination. The adhesion promoters which remain largely invisible to the human eye. For in-process control, certain products contain a luminescent dye that can be detected under UV light.	Sika® Aktivator-100 Sika® Aktivator-205 LUM
Sika® Primer	Solvent base coatings containing adhesion promoters and fillers. They react with the surface and form a thin layer. Primers are normally black or transparent. The layer is good visible by eye. For in-process control, certain products contain a luminescent dye that can be detected under UV light.	Sika® Primer-207 Sika® Primer-507

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Sikaflex®-200	Adhesives and sealants based on polyurethane. With 1-component products, the water molecules from the air react with the isocyanate group of the prepolymer, finally forming a durable cross-link between prepolymer chains.	Sikaflex®-268
Sikaflex®-500	Adhesives and sealants based on silane terminated polymers (STP) that use a polymer binder containing reactive silane groups.	Sikaflex®-521 UV
Sikaflex®-600	Adhesives and sealants based on Sika's Purform® polyurethane technology, engineered to minimize monomeric diisocyanate content to less than 0.1%.	Sikaflex®-668
Sikaflex®-900	Adhesives and sealants based on polyurethane or silane terminated polymers with an additional B component to speed up the curing process.	Sikaflex®-953 L30
SikaBooster®	SikaBooster® is an accelerator which can be added to certain Sikaflex® products to make the curing process significantly faster and independent of air humidity.	SikaBooster® P-50
Sika® PowerCure	Sika® PowerCure is application equipment technology specially developed to manually apply Sikaflex® products with SikaBooster®.	Sikaflex®-268 PowerCure
SikaTack®	SikaTack® is a range of polyurethane adhesives designed for applications such as windshield replacement in the automotive aftermarket. These products largely follow the principles that apply to the Sikaflex® range.	SikaTack® Drive
Handwipes	Products (wet towels) designed to safely clean hands of wet contaminations such as grease, oil, adhesives or sealants.	Sika® Cleaner-350H

5 TRANSPORT AND STORAGE CONDITIONS

5.1 GENERAL

Keep products in dry environment, protected from rain, snow and direct sunlight. Store liquid products in an upright position. The ideal transport and storage temperature is 25 °C or below. This temperature cannot always be fully maintained when transporting the goods. Conditions that temporarily occur in shipping containers, airfreight, or truck deliveries have therefore been considered in the shelf life specified in the corresponding Product Data Sheet.



Validity

These recommendations for transportation are valid for Sikaflex®-200, Sikaflex®-600 as well as the Sikaflex®-500 series. For Sikaflex®-900 series, see instructions in the Product Data Sheet.

1. Always read the current Product Data Sheet for recommended storage conditions.
2. For information on safety aspects during transport, see Safety Data Sheet.

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5.2 SUMMER

Air temperatures and humidity are typically high in the summertime. Adhesives, sealants, activators and primers change properties with higher temperature and humidity. All products have therefore a certain shelf life, which ends with the "best before" date.

The application characteristics of sealants and adhesives may change, such as difficulties to gun or extrude, gloss, longer cut-off string, worse non-sag property, etc. The final properties of the cured product would not or only marginally be impaired. In case of a substantial viscosity increase, the wetting properties could be compromised, potentially negatively influencing the adhesion behavior.

Sika® Aktivator and Sika® Primer must be stored according to the defined conditions. It is very difficult to identify if a pre-treatment agent is compromised or not. Therefore, it is required to store them properly and never use them after the expiration date.



Premature aging

For products on the production line, where maintaining the ideal application temperature during summertime is challenging, Sikaflex® products can still be utilized for up to three weeks, provided that the ambient temperature does not exceed the maximum application temperature specified in the Product Data Sheet, which is 40 °C for most products.

1. If Sikaflex® products were not stored under the defined storage conditions, they must be tested for suitability prior to use. Application properties and adhesion must be evaluated by tests.
2. In case of Sika® Aktivator and Sika® Primer the defined storage conditions need in any case to be respected.

5.3 WINTER

Storage at temperatures much lower than 25 °C has no adverse effect on adhesives, sealants, and solvent-based pre-treatments. If products have been exposed to low temperatures, ensure that the material is stored long enough in a warm environment to reach the recommended application temperature. The required waiting time for this process depends on temperature and the type of product packaging. It is usually hours for cartridges, unipacks or cans and days for drums or pails.



Product sensitive to freezing temperatures

Consider, that water-based products such as some Sikaflex®-900 series products, Sika Hydro range, Sika® Tooling Agent, etc. are frost sensitive.

1. Store frost sensitive products above 5 °C to prevent freezing
2. Ensure for cold stored products to get them to application temperature before use. Storing products before use at the production line is a common practice to ensure proper product temperature.

6 WORKPLACE CONDITIONS

The conditions under which the products are applied can affect the quality of the finished bond or sealing joint. The workplace shall be as dust free as possible. Dust or interfering chemicals such as alcohols, silicones or greases can impair the function, durability, and appearance of adhesives and sealants. Therefore, keep such products and substances away from the bonding process. Furthermore, climate conditions have an influence on the application and curing process of sealants and adhesives as well as the flash-off time of pre-treatments.

The most important points are noted below. For further information, read EN 17460 and EN ISO 21368 or any other applicable standard for sealing and bonding.

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Standard conditions versus real conditions

Be aware that all values stated in the Product Data Sheets are based on standard conditions (23 °C / 50 % r.h.). Other conditions will influence these values in one way or another. In winter, with low temperatures and air humidity, the evaporation of solvents and the curing of 1-component product is slower. In summer (high temperatures and humidity), products react faster, which affects the open, skin and curing time of adhesive and sealants.

1. Maintain consistent temperature and humidity throughout all seasons is the best practice scenario, when possible, especially for areas where products are applied and cured.
2. When it is not possible to maintain consistent climate conditions, the above-mentioned application properties must be considered.

6.1 REQUIREMENTS

Cleanliness

- The workplace shall be free of dust, oil, fat, silicones and release agents.
- Alcohol-containing or alcohol-releasing products such Sikaflex®-500 (also MS, modified silicones) can impair the polyurethane from curing. Therefore, such products and substances shall be separated from the bonding process with polyurethanes (Sikaflex®-200 and -600).
- Contamination of substrates by silicone or silicone oil will inhibit pre-treatments and adhesives from adhering to substrates. The bonding and sealing area shall be separated from other areas and marked with corresponding signs.

Climate

The ambient temperatures and the temperature of products and substrates shall be in the same range. The optimal, recommended application temperature for Sikaflex®, pre-treatment products, and the substrates is between 15 °C and 25 °C. The extended range is between 5 °C and 40 °C. This range may vary for certain products. For specific information, see Product Data Sheet.

Table 1 Application temperature

Lowest temperature	Optimal range	Highest temperature
5 °C	15 – 25 °C	40 °C

- Bonding surfaces need to be clean and dry prior to the bonding process. To avoid substrates to get wet by condensation, the temperature of the components to be bonded (e.g. façade panels, sub-frames) must be at least 3 °C higher than the dew point of the air.
- Application at lower temperatures: The product is harder to extrude (gun) which might lead to poor adhesion due to reduced wetting ability. Curing, and as well as strength development, will be delayed. The aspect of the visible joints may be impaired due to more difficult smoothing behavior.

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6.2 OPEN TIME AND SKIN TIME

The above conditions obviously affect the time the user has between applying the adhesive or sealant and the joining or smoothing operation.



Respect open time

Skinning of the adhesive before assembly impairs adhesion. Never join or tool adhesives or sealants after skin time.

1. Always join bonding parts or smooth joints before the adhesive or sealant has formed a skin.
2. Where skinning has occurred, it is necessary to remove the bead and repeat the adhesive application.

The open time specified in the Product Data Sheet is the time that considers the most important factors, such as skin time, but also the force required to compress an adhesive bead. For most 1-component products, the skin time determines the open time. A small safety margin is usually embedded to ensure that the product operates reliably under different conditions. In any case, it is important to assemble or smooth the product before the skin time, which is achieved if the open time is observed.

Consult the Product Data Sheet for the recommended open time at a certain climate condition.



Considerations at elevated ambient temperatures

Using sealants and adhesives at significantly elevated temperatures may result in poor adhesion due to faster skinning. Surfaces with a high degree of absorbed humidity can provoke bubble (blister) formation at the interface between the substrate and the products. Direct sunlight can heat up substrates and exposed adhesive beads above the maximum recommended temperature.

1. Make sure to work under recommended ambient conditions
2. Prevent direct sunlight on adhesive or sealant joints until products have formed a solid skin.

6.3 CURING SPEED

1-component Sikaflex® products cure from outside to inside by exposing them to moisture in the air (Figure 1). In general, the curing of Sikaflex® products varies between 3 mm and 4 mm in the first 24 hours at 23° C and 50 % relative humidity. Whenever the climate condition significantly deviates from the test condition the actual curing speed will vary.



Figure 1 Humidity curing principle

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The below chart (Figure 2) shows the curing speed of a typical Sikaflex® product at three different climate conditions.

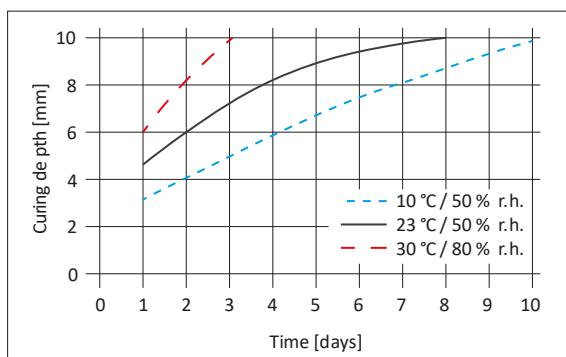


Figure 2 Depths of cure at three different climate conditions

While the influence of temperature and humidity has an obvious impact on the curing speed of 1-component Sikaflex® adhesives and sealants, such products will still work reliably and fast enough in climate conditions that are typical for manufacturing facilities and even outdoor applications. For most applications, following assembly steps or even re-use of the bonded part can take place before complete curing.

Where the greatest possible independence of climate conditions is crucial, products from the Sikaflex® range compatible with SikaBooster® or Sika® PowerCure are an ideal solution. Another option is the use of a product from the Sikaflex® 900 series.

7 SELECTING ADHESIVES AND SEALANTS

The product selection must be based on the specific requirements of the application such as loads, substrates characteristics or climate conditions. For this purpose, the current Product Data Sheets and, if available, further information from Sika must be considered. During planning and selecting, considerations must be taken into account such as the detailed production process, its intended application, expected service life, inspection and reparability of the final assembly and the joints. These factors may be crucial for the joint design and geometry.

7.1 DIMENSIONS

The design and dimension of adhesive joints and seals shall be based on information from the current Product Data Sheet and other available technical information such as Sika's Additional Product Information (API), Additional Technical Information (ATI), Guidelines, etc. Due to the variety of applications and specific requirements the information beforehand may not be conclusive.

Since 1-component Sikaflex® cures by air humidity, the size of the adhesive layer has an influence on the time required for complete curing (curing means the chemical crosslinking that forms a durable polymer elastomer). In a standard climate (23 °C / 50 % rel. humidity), adhesive joints with a width of 20 mm need about 1–2 weeks for this process (Figure 3). Wider joints also cure, but the time to complete the curing becomes disproportionately longer. In such situations, it is recommended to use a system that cures independently of humidity and joint size, for example, a product used with SikaBooster® or Sika® PowerCure or one from the Sikaflex®-900 series.

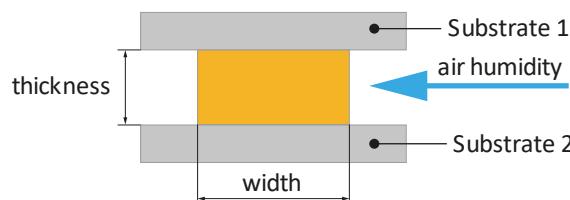


Figure 3 Width and thickness of adhesive layer

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If the gap next to an adhesive layer is filled with a sealant (Figure 4), air humidity can only penetrate from one side. This leads to extended curing times. It is therefore recommended to allow the adhesive to partially cure before applying the sealant or to use a product compatible with a product from the SikaBooster® or a Sika® PowerCure series.

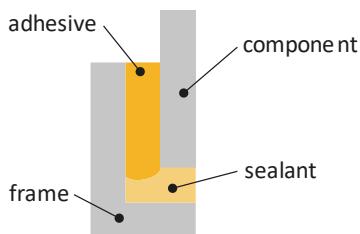


Figure 4 Adhesive layer plus gap filler

After curing, the adhesive layer can fulfill its function completely. One of these functions is to absorb movements caused by thermal expansions or mechanical stress. The adhesive thickness for this elastic behavior is typically 3 mm or more, depending on the size of the parts to be bonded, the expected thermal or mechanical movements, or the tolerance to be compensated. Adhesive layers that are too thin can lead to delamination or fractures of the bond line.

7.2 DESIGN

- The design of the joint plays an important role in the longevity of the bonding adhesive or sealing joint.
- For existing applications, the design and dimension of adhesive joints and seals is usually based upon currently available specifications. For new applications, adhesive joint and seal designs are to be based on values of the current Product Data Sheet and other data available through Sika. If necessary, Sika employees can help.
- When bonding or sealing transparent and translucent substrates, it is important to protect the adhesive bond face from sunlight. Tried and tested solutions are either an optically dense ceramic frit (as for most glass for vehicles) or a cover impermeable to light (e.g. masking tape or trim). Sika's black primers are not sufficient for a long-term exposure to UV.
- Design adhesive bonding joints and corresponding surfaces so that no standing water can occur. For cavities, it is advisable to install a drain for condensation water.
- When installing windshields with an integrated heater, sealants and adhesives must be applied in such a way as to prevent cavities, as water can collect there, which can lead to short circuits and corrosion.

In case of installation of a laminated safety glass windshield with incorporated heating elements or radio aerial in the interlayer foil a special bonding procedure may be required.

7.3 COMPATIBILITY

1-component Sikaflex® are largely chemically compatible with each other. They also have no significant interactions with most substrates. Nevertheless, some points must be observed. The most important are listed here. In any case, we recommend carrying out compatibility tests in the event of uncertainties, especially when bonding and sealing plastics or rubber-like materials.

! Use of Sikaflex®-500 products (or modified silicones MS or silicones) together with Sikaflex®-200/600 products

The curing reaction of Sikaflex®-500 products (as well as modified silicones MS or silicones) releases methanol, which can block the curing mechanism of Sikaflex®-200/-600 and Sika® Primer.

1. Do not apply Sikaflex®-500 products directly next to or on top of fresh Sikaflex®-200/-600 or Sika® Primer. Wait until the Sikaflex®-200/-600 has already formed a skin and has been partly cured. An easy rule of thumb is to wait until the other workday.
2. Do not apply the Sikaflex®-200/-600 product directly next to or on top of fresh Sikaflex®-500 product. Wait until the Sikaflex®-500 has partly been cured.

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Laminated glass

The interlayer foil of laminated glass can consist of different materials. PVB (Polyvinyl butyral) is the most common foil used in windshields for cars. However, other foils may be used for other glass types. These foils might not be compatible with Sikaflex® adhesives and sealants.

1. The compatibility of Sikaflex® and interlayer must be confirmed by test before the application.
2. Ensure constant quality of the foil and re-test in case of changes.

PMMA, PC, ABS and other thermoplastics

Special attention must be paid to cases where thermoplastics (such as PMMA, PC, ABS, etc.) must be bonded. These materials have a tendency towards environmental stress cracking (ESC), which can result in substrate weakening, fracture or adhesion loss.

1. Only specific products are suitable as pre-treatments, adhesives, or sealants for these materials.
2. Frozen stresses in thermoplastic substrates play a crucial role and need to be considered. Preliminary ESC tests are highly recommended. Consider tempering parts to reduce frozen stress.

7.4 THERMAL RESISTANCE

The long-thermal resistance of Sikaflex® is sufficient for most climate zones if the products are used for applications as described in the Product Data Sheet. Special attention must be paid for application outside the scope or use under extreme temperature conditions such as engine compartments or deserts. In such situations, it might be advisable to change to a solution based on silicone technology (Sikasil®).



Maximum temperatures in service

The long-time thermal resistance is generally 90 °C maximum. There are exceptions in which this value is lower or higher.

1. Find specific values in the current Product Data Sheet. If a higher temperature is expected, clarify which products or technologies are available for the purpose.
2. For short-term exposures to higher temperatures (e.g. during paint backing processes) see Product Data Sheet.

7.5 CHEMICAL RESISTANCE

Sikaflex® products are generally resistant to fresh water, seawater, diluted acids and diluted caustic solutions; temporarily resistant to fuels, mineral oils, vegetable and animal fats and oils; not resistant to organic acids, glycolic alcohol, concentrated mineral acids and caustic solutions or solvents.

Factors of critical importance are the exposure duration and temperature, the type and concentration of chemicals, the joint design and the choice of adhesive or sealant. If adhesive or sealant joints are exposed to permanent or aggressive chemical attacks, it is essential to seek the advice of Sika.



Use of cleaning agents

Industrial cleaning agents that are used to clean contaminations on trains, trucks or other objects may over time damage sealants and adhesives if not suitable or not used properly.

1. Products with a low or high pH value must be tested for their long-term impact on sealants and adhesives.
2. Always follow the instructions for the cleaning agent. In general, all cleaning agents that may come into contact with adhesives or sealants must be rinsed off thoroughly with clean water to avoid product residues on the sealant or adhesive.

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8 SUBSTRATE PRE-TREATMENT

Sika Pre-Treatment Charts serve as a guide for preparing substrates prior to bonding and sealing. They also contain important and helpful information about substrate characteristics. In any case, it is imperative and crucial to evaluate suitable surface preparation procedures by testing on original substrates.

The surface characteristics of the substrates strongly affect the build-up of adhesion and the final bond strength. Therefore, it must be ensured that surfaces of all bonded components are constant and uniform and refer to the tested surfaces in terms of chemical composition, manufacturing processes, production aids such as mold release agents or preservatives such as waxes, oils, etc. to ensure constant adhesion in serial production. Paint coatings must be carefully evaluated and specified. The chemical composition of the paint, type of substrate preparation, application parameters, and the presence of softeners (plasticizers) and other additives in the paint can affect final adhesion. Be aware that specific substrates, such as engineered plastics, require special attention. Pre-treatment systems for adhesives can largely compensate for quality fluctuation of substrates, but not beyond critical or previously unknown levels. It is recommended making the substrate suppliers aware of these facts to ensure continuous surfaces through agreements or contracts. Consider quality control of surfaces of incoming substrates.



Shades of topcoat

Different shades of the same topcoat may exhibit different adhesion behavior.

1. Make sure to check adhesion on all shades used in combination with bonding and sealing.
2. In case of high variety, consider bonding on the base coat instead topcoat

Copper, brass and other alloys containing copper

Bonding and sealing non-ferrous metals such as copper and copper-containing alloys can be challenging.

Compatibility issues can be caused by various factors, such as the type of adhesive technology, the composition of the metal/alloy, exposure to hot and humid environments, and combinations of these factors.

1. Therefore, it is mandatory to conduct specific project-related tests for each project with such metals
2. Usually, the problem can be solved by selecting a suitable coating or primer by means of adhesion tests

Flash off time under varying temperatures

Flash-off times of pre-treatment agents are longer at lower temperatures and vice versa.

1. Follow the instructions in the Product Data Sheet.
2. Ask your local Sika representative for further information if the information in the Product Data Sheet does meet your requirements.

Pre-treating porous substrates

Solvents applied to porous substrates cannot evaporate properly and then might block the chemical reaction of adhesives and sealants.

Sensitivity of substrates

Some substrates such as certain plastics or paints are sensitive to solvents or other chemicals. Pay attention to the compatibility between substrates and cleaning agents.

1. Check sensitive substrates by applying the pre-treatment agents on a sample.
2. Check for any unacceptable changes.

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Application of pre-treatments

- Rotary tools such as a polishing disc or similar are not suitable for the application of pre-treatment agents.
1. Use the application method recommended in the Product Data Sheet.
 2. If the defined application method is not suitable or automatic application are required get in contact with Sika for advice.

Protection of pre-treated surfaces

Surfaces which have been treated with activators and/or primers must be protected from recontamination or soiling prior to application of the adhesive or sealant. To avoid cross-contamination, incompatible products such as silicone sealants, paints, solvents (especially alcohol-containing chemicals) and cleaning agents must be kept away from the bonding area.

1. If necessary, cover pre-treated surfaces with a clean paper towel or residue free plastic foil. Note that certain plastic foils that can exhibit plasticizers.
2. Dust or other light soiling must be removed with a dry, residue-free paper towel. Heavier soiling, such as heavy fingerprints, can often be removed with a cleaner such as Sika® Cleaner G+P or - if necessary - with Sika® Cleaner P or isopropanol alcohol. If the surface was pre-treated with Sika® Aktivator, reapply Sika® Aktivator to the cleaned area.

Weathering and aging of substrates

Substrates like shop primers or e-coatings can change adhesion properties depending on their age, especially if exposed to sunlight or weather in general. It is therefore important to protect the substrates in the warehouse from unnecessary exposure and make sure adhesion tests are done on samples that represent the quality at the bonding station.

1. Protect substrates from sunlight and weathering, especially organic materials such as plastics, paints, shop primers and other material that change their properties under exposure.
2. Ensure adhesion tests are performed on substrate samples that represent the actual substrate condition used at the point of bonding.

Corrosion protection

Corrosion of substrates can result in adhesion loss of adhesives and sealants. Primers and activators are not primarily designed to protect metals against corrosion. Depending on exposure and service conditions, substrates must be protected against corrosion before the bonding process. Typical methods such as phosphating, shop primers or other common methods usually create good conditions for subsequent treatment for bonding.

1. Ensure adequate corrosion protection of substrates used for bonding and sealing applications.
2. Avoid standing water next to the bond line.

Transparent and translucent substrates (glass, FRP, thermoplastics)

Durability of adhesion is vital for a long-lasting bond. Sunlight (in particular the UV radiation range) can degrade the bond face of PUR and STP adhesives or sealants applied on transparent substrates, with the consequence of adhesion loss after months to years depending on transparency. Organic primers and other coatings such as paints also degrade under sunlight.

With transparent or translucent substrates where the bonded surface is exposed to direct sunlight, an adequate UV barrier must be incorporated to shield the adhesive bond. This may consist of an opaque cover strip, an optically dense glass ceramic or a black primer for semi-transparent substrates such as translucent FRP or thermoplastics. Due to the high UV exposure for exterior applications the sole use of black primers for UV protection may not be sufficient. For interior applications and where the bond line is occasionally exposed, the substrate's own absorbance or a sole black primer for UV protection might be sufficient as the sole UV protection.

1. Always use proper UV protection for transparent or translucent substrates, such as trims or covers.
2. Depending on the light transmission rate, certain substrate can be adhesive bonded with reduced extra UV protection. Seek advice from Sika for further advice.

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Proper use of application tools

Never use the same tool for application of activators and primers. Activators may contain alcohol and will block the reaction of polyurethane based primer.

Aktivator do not only active the surface, but also degrease and clean it as the same time. The same applies to primer to a certain extend.

1. Use application tools (paper tower, brush, daubers etc.) for the same product only.
2. Immediately dispose of application tools that have been accidentally wetted with a second product.
3. Frequently replace application tools to prevent using contaminated tools.

8.1 SURFACE PREPARATION TECHNIQUES

Surface preparation typically consists of one or more methods described in the following paragraphs. The method used must be selected according to the specific type and composition of the substrate.

Sika provides chemical surface preparation products like cleaners, activators and primers. Therefore, they are described in the following chapters. Other preparation techniques such as mechanical, e.g., grinding, sanding, etc. or physical chemical (like plasma, flame or corona) are not described within this guideline.

The method used must be selected according to the specific type and composition of the substrate.

8.2 CLEANING (E.G. , SIKA® REMOVER AND SIKA® CLEANER SERIES)

Although it is often not visible, almost every substrate contains loose or chemically unbound substances such as dust, rust deposits, oils, grease, etc., which must be removed before bonding or sealing.

Heavily soiled substrates can be cleaned with Sika cleaning agents (e.g. Sika® Remover-208), or another suitable degreaser. If necessary, remove loose parts and / or unstable layers by lightly scuffing with an abrasive pad. Many substrates with light contaminations can be prepared by a dry wipe or cleaning using a recommended solvent-based cleaner such as Sika® Cleaner P or isopropanol. Where no solvents are needed to remove the contamination, the partly water-based Sika® Cleaner G+P could be sufficient.

In applications where Sika® Aktivators are required and there is minor contamination, an extra cleaning step can usually be skipped. Sika® Aktivators have a good cleaning performance but also leave visible adhesion promoters on the surface. It is therefore important to observe the correct application method for Sika® Aktivators on the Product Data Sheet to get the desired cleaning effect and prevent overuse of adhesion promoters.

The products described above may impair the surface or even have a negative impact on the properties of sensitive substrates. It is therefore recommended to test the products on a sample of the substrate before use, which shall include testing adhesion.



Cleaning agents with PUR products

Cleaners can contain alcohol. Alcohol inhibits the curing of polyurethane products.

1. Never use any alcohol-based products to clean areas with freshly applied polyurethane.
2. Use Sika® Remover 208 to clean fresh products from tools. Do not use any solvent based cleaners on skin.

8.3 ACTIVATING (E.G. , SIKA® AKTIVATOR SERIES)

Activators consist mainly of solvents and adhesion promoters. They are applied with a clean, lint free paper towel. Apply Sika activators sparingly to the paper towel and wipe the surface with a straight light stroke. Often change to a clean part of the paper, so that already removed dirt is not transferred back to the substrate. Dispose of used towels following local environmental regulations. Some Sika activators require a wipe-off step, i.e., the excess on the surface must be wiped off immediately with a clean, dry paper towel. The application method of a specific Sika® Aktivator can be found in the corresponding Product Data Sheet. The adhesive or sealant must be applied within the maximum flash-off time mentioned in the current pre-treatment Product Data Sheet.

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Sika® Aktivators function as moisture-reactive systems. It is crucial to promptly reseal the container using the inner plastic liner promptly after extracting the product from the container. Once the surface pre-treatment operation is completed, the cap must be screwed on. Unless stated otherwise in the Product Data Sheet, it is recommended disposing of products approximately one month after opening if used frequently or after two months in case of infrequent use.



Prevent application to adjacent surfaces

Treat only the bonding face. If Sika® Aktivators accidentally get on adjacent surfaces, they may be visible or damage the surface.

1. Thoroughly mask adjacent surfaces.
2. Wipe spills off immediately using a clean, dry paper towel; some stains may remain permanently.

Lower and upper flash-off time limits

Each Sika® Aktivator has a minimum and maximum flash-off time prior to the adhesive application. If the adhesive is applied too quickly, solvents or other substances in Sika® Aktivator are not fully evaporated and might reduce the bonding performance. If the adhesive is applied too late, there may be insufficient still active adhesion promotores, which may lead to poor adhesion.

1. Respect the minimal flash-off time as stated in the Product Data Sheet.
2. When the maximum time has elapsed, it may be possible to perform a reactivation process. Contact your local Sika representative for further information.

Change in appearance of pre-treatment agents

Wrong storage (open cans, too higher temperature) or wrong use (contaminated application tools) can cause a change in appearance of the pre-treatment agent. Possible effects are cloudiness or color changes. Such changes often indicate a loss of functionality. As this is difficult to identify with Sika® Aktivator, it is essential to strictly follow the instructions in the Product Data Sheet.

1. Dispose of suspiciously looking pre-treatment products
2. Dispose of products that were exposed to humidity, e.g. lid not replaced promptly or for external applications when an open can was exposed to rain.
3. Ensure proper storage and use of products as per instructions in the Product Data Sheet.

8.4 PRIMING (SIKA® PRIMER SERIES)

Sika® Primer products are clear or pigmented liquids – like a paint - applied to substrates which dry to form a covering film, which is an ideal surface for adhesion.

Primers are generally applied with a clean, dry brush, wool dauber, a special felt pad, or an open-cell elastic melamine foam applicator. A wide range of applicator systems are available at suppliers such as www.designetics.com. Some Sika® primers can be spray-applied. In such cases or for other specific needs, which cannot be met by one of the standard application methods, always contact Sika Technical Department for advice.

Each Sika® Primer requires a specific flash-off time range before adhesive application. Applying adhesives or sealants outside this range can impair adhesion.

Sika® Primer products are moisture reactive systems. It is crucial to promptly reseal the container using the inner plastic liner after extracting the product from the container. Once the surface pre-treatment operation is completed the cap must be screwed on. Unless stated otherwise in the Product Data Sheet, Sika recommends disposing of products approximately one month after opening if used frequently or after two months in case of infrequent use. Change in appearance or increase in viscosity indicates loss of functionality of pre-treatment agents. Such products must be disposed of immediately.

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Change in appearance of Sika® Primer

Wrong storage (open cans, too high temperature) or wrong use (contaminated application tools) can cause a change in appearance of the pre-treatment agent. Possible effects are lumps or poor application properties. Such changes often indicate a loss of functionality.

1. Dispose of suspiciously looking pre-treatment products.
2. Ensure proper storage and use of products as per instructions in the Product Data Sheet.

Lower and upper flash-off time limits

Each Sika® Primer has a minimum and maximum flash-off time prior to the adhesive application. If the adhesive is applied too quickly, solvents or other substances in Sika® Primer are not fully evaporated and might reduce the adhesion performance. If the adhesive is applied too late, there may be insufficient still active adhesion promoters, which may lead to poor adhesion.

1. Respect the minimal flash-off time as stated in the Product Data Sheet.
2. When the maximum time has elapsed, it may be possible to perform a reactivation process. Contact your local Sika representative for further information.

9 APPLICATION OF ADHESIVE AND JOINING

9.1 METHOD

Sika adhesives and sealants supplied in cartridges and unipacks are applied with a pneumatic-, electric- or manually operated application gun. They may also be dispensed from drums and pails using a pump system. To limit air entrapment during the application and to apply the right amount, adhesives are best applied in the form of a triangular bead.

It is crucial to ensure that no voids or areas for standing water are formed between the adhesive and sealant joints by ensuring that the adhesive and sealant completely fill the joint. The joint should be designed that condensed humidity can escape by using an interrupted bead or ventilation openings.

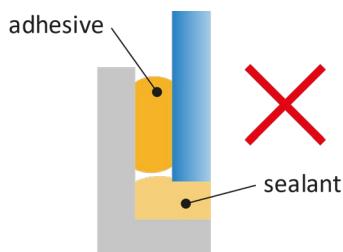


Figure 5 Filling not correct

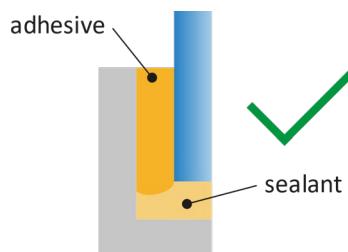


Figure 6 Correct filling

9.2 SPACERS

To maintain the thickness of the adhesive layer, the use of elastic rubber spacers with the same or lower Shore A hardness as the adhesive is recommended. Semi-spherical shaped, pressure-sensitive-adhesive-backed spacers are established as best practice.



Compatibility with spacers

Compatibility between spacers and adhesive must be checked in advance to avoid decomposition of spacer or adhesive. Cyanoacrylate-based adhesives are usually not suitable to secure spacers. Their use can lead to an adverse chemical reaction between the Sika products and cyanoacrylate, resulting in adhesion loss.

1. Check the compatibility between spacer and adhesive by exposing them for a few weeks on a sample.
2. Use self-sticking spacers or a small amount of adhesive instead.

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Wrongly placed spacers (Figures 7 and 8) can lead to cavities and leakage. Spacers shall either be embedded into the adhesive or positioned slightly away from the bead (Figures 9 and 10).

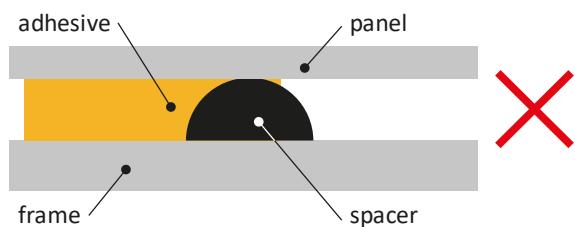


Figure 7 Position at the edge of bond line



Figure 8 Spacer size too big for bond line width

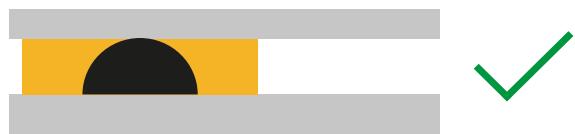


Figure 9 Proper size and fully embedded



Figure 10 Positioned outside the bond line

The components are assembled by applying uniform pressure to the joint, either by hand or with a suitable clamping device, until the adhesive bead has been compressed to the specified thickness.

If the adhesive has been compressed below the specified thickness, do not pull the bonded parts back to the correct thickness, since this procedure could reduce the contact area. Leave it if the adhesive thickness is still acceptable or take it apart and repeat the bonding procedure with a fresh adhesive bead.

Waiting and curing times must be strictly observed before the bonded assembly is released for further processing. Waiting times are determined by the load on the adhesive joint and the climatic condition.

9.3 TOOLING AND SMOOTHING

In uncured condition, Sikaflex® can be easily formed to smooth a sealing joint. Such tooling is carried out using the most suitable tool for the desired shape, such as a spatula, spoon etc. The procedure can be optimized using Sika® Tooling Agent N or another appropriate tooling liquid. For later overpaint-ability of adhesives and sealants, consult the relevant Product Data Sheet.



Use suitable tooling agent

Tooling with products such as solvents, concentrated detergents or other cleaners may cause tacky surfaces, discoloring or accelerated aging of the smoothed surface.

1. Never use alcohol or alcohol-containing products as a tooling agent (it prevents the polyurethane from curing).
2. Do not use pre-treatment agents as tooling agents.
3. If the sealant will be painted, remove the tooling agent prior painting.

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10 ADHESION TESTS

It is recommended to perform adhesion tests with actual substrates to ensure adhesion and material compatibility. Sikaflex® 1-component products are elastic adhesives. This allows adhesion tests using a bead peel test according to ISO 21194 / DIN 54 457. The method is used to compare the efficiency of different cleaning or pretreatment steps, or to rate the influence of aging cycles on adhesion. The following text describes the principle of the procedure.



Artificial aging

The procedure described below may not be sufficient to predict or ensure good adhesion during the entire service life. Depending on the intended use, artificial aging processes may be necessary to assess adhesion over the expected life span.

1. In case of absence of own specifications, consult ISO 21 194 or DIN 54 457 for further information.
2. In lack of own experience, seek advice from experts for artificial aging to choose the most suitable procedure(s).

10.1 PROCEDURE

Peel testing is done in the three phases application, testing and rating.



Safety cautions

Peel testing involves using a razor knife and other tools that could cause injuries if not handled properly.

1. Follow the safety instructions provided by the supplier of knife and other tools.
2. If necessary, fix the substrate to be tested to a stable table with the help of screw clamps or similar.
3. Always cut in the direction away from you.
4. Consider wearing safety glasses and protective clothing, especially on substrates that may shatter, such as glass.

Application

- Apply a triangular bead (typically 10 mm x 10 mm) of approx. 10 cm length on an original substrate which has been prepared following the corresponding Sika Pre-treatment Chart or Working Instructions.
- Use release paper, wax paper or polyethylene foil to press down the bead to about half of the bead height (see Figure 12 and Figure 13).
- Allow the bead to cure for 7 days at room temperature (ideally 23 °C / 50 % relative humidity) before evaluating the adhesion. Accelerated products (SikaBooster® and PowerCure, Sikaflex®-900 range) can be tested after 24 hours.

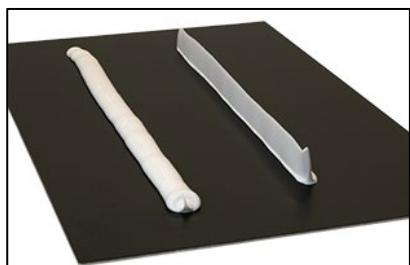


Figure 11 Apply beads (triangular and round shape)



Figure 12 Apply release paper or PE foil



Figure 13 Press the bead to half the height

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Testing

- Put the part to be tested on a workbench or sturdy table. Secure the part to be tested to a table. If necessary, use clamps to prevent the test sample from moving while testing.
- Then use a sharp razor knife to separate the first 2 – 3 cm of the leading edge of the bead from the substrate (see Figure 14).
- Hold the separated part of the bead with a pair of needle-nose pliers and slowly turn the bead (applying peel stress), attempting to separate it from the substrate. Just before the adhesive breaks, cut the bead bottom down to the substrate as shown in Figure 15. This maximizes the peel effect.
- Test on a length of at least 5 cm.



Figure 14 After complete curing, separate the first 2 – 3 cm of the bead

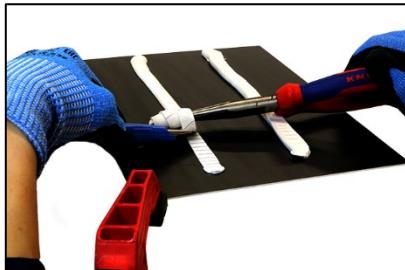


Figure 15 Twist the bead to get maximum peel tension; cut regularly

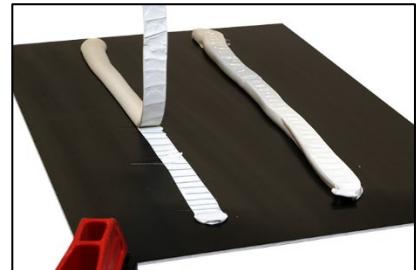


Figure 16 Rate the adhesion

Rating

There are three distinct types of failure:

- Adhesion failure occurs when the Sikaflex® pulls cleanly off the substrate.
- Substrate failure occurs when the substrate itself tears.
- Cohesive failure, which is optimum, occurs when the Sikaflex® itself tears.

A combination of failure modes is also possible. 95 % or greater cohesive failure is considered excellent adhesion. Cohesive failure of 75 % is considered acceptable in many cases. Depending on the requirements, the test samples can be exposed to artificial ageing conditions (like water and heat) and the testing and rating repeated after each ageing step. For details, see ISO 21 194 or DIN 54 457.

11 QUALITY ASSURANCE

Quality assurance measures play a vital role in adhesive bonding technology. These include the following points:

- Record parameters such as exact product names and batch numbers of all adhesives and pre-treatments, temperature, humidity, date, item ID, object identification number, and staff names.
- Monitoring the substrate materials for consistency. Make the substrate supplier aware of the importance of the consistency of the surface and consider establishing a supply specification. Repeat adhesion tests if changes occur. For more information about adhesion tests, see chapter 10
- Detailed Working Instructions must be clearly displayed at the workplace. The instructions shall be easy to read and preferably based on pictograms (no language problems, and the information is easier to understand).
- A responsible person must be appointed to monitor compliance with these instructions. Regular production process reviews must be carried out and recorded in writing.
- Periodic training for employees (internal and external) are necessary. It is important to ensure that all adhesive bonding operations are carried out by trained and qualified staff only.
- It is recommended to test bonded parts regularly to ensure they meet specifications and expectations. Besides visual inspection checks for cavities and such, destructive testing may be necessary.

For further information, read EN 17460 and EN ISO 21368 or any other applicable standard for sealing and bonding.

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12 CLEAN-UP

Excess uncured Sikaflex® can be removed with Sika® Remover-208 or mineral spirits in case of non-porous substrates. Alcohol-based cleaning agents are not suitable because they permanently prevent polyurethane from curing. Cured products can only be removed mechanically.

Always check the compatibility of the cleaning agent with adjacent surfaces.

Never use solvents to clean hands. Instead, use handwipes such as Sika® Cleaner-350H Handclean or similar products.

13 MAINTENANCE AND REPAIR

Elastic sealing and adhesive joints can be separated and rejoined simply and easily. This can be important for components that have to be replaceable, such as windshields. Joints that need occasional maintenance need to be accessible for the tools used to separate adhesives or sealants, which are typically cutting wires, sharp blades or oscillating knives.

13.1 ADHESIVE JOINTS

Adhesive joints are usually maintenance free, except if they are permanently exposed to chemicals, harsh weathering, or similar. Depending on the type of expected exposures, the bond line can be protected from damage, for example, by an additional seal with a suitable sealant used to shield the actual bond against the medium. If the protective sealed joint wears out, it can simply be repaired by replacing the worn layer with fresh sealant.

13.2 SEALING JOINTS

Sealing joints prevent moisture or water ingress and can protect bond lines from environmental influences. Therefore, sealing joints must be considered as parts that require a periodical inspection and – if necessary - maintenance. To allow inspection and maintenance, sealing joints must be accessible and repairable. For demanding sealing applications, it is recommended to define inspection plans and repair procedures.

13.3 WASTE SEPARATION

Cured adhesives can be disposed of in accordance with the national regulations. If necessary, adhesive beads can be mechanically separated from the substrate. Since elastic adhesives and sealants are relatively soft, they can be easily separated from the substrate with a blade or a sharp scraper.

14 LEGAL NOTE

The information and, in particular, the recommendations relating to the application and end-use of Sika products, are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. In practice, the differences in materials, substrates and actual site conditions are such that no warranty in respect of merchantability or of fitness for a particular purpose, nor any liability arising out of any legal relationship whatsoever, can be inferred either from this information, or from any written recommendations, or from any other advice offered. The user of the product must test the products suitability for the intended application and purpose. Sika reserves the right to change the properties of its products. The proprietary rights of third parties must be observed. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

GENERAL GUIDELINE

Bonding and Sealing with 1-component Sikaflex®

March 2025, Version 6.1

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