



GENERAL GUIDELINE

Window Bonding

Sikasil® WT Adhesives

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BUILDING TRUST



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1 PURPOSE AND GENERAL INFORMATION

This document contains recommendations and hints for the application of Sikasil® WT adhesives in window bonding applications. This guideline is relevant for the following products:

Table 1: Overview of Sikasil® WT adhesives

Window bonding adhesive	Chemical base
Sikasil® WT-40	1-component silicone adhesive
Sikasil® WT-65	
Sikasil® WT-66 PowerCure	1-component boosted silicone adhesive
Sikasil® WT-470	
Sikasil® WT-480	2-component silicone adhesive
Sikasil® WT-485	

The information herein is offered for general guidance only. Since bonding of windows is a high demanding application and conditions as well as substrates may vary greatly, customers and applicators must test the suitability of the product for each specific project and contact Sika for advice.

This guideline has to be read in conjunction with the relevant Product Data Sheets and Safety Data Sheets.

This document covers general recommendations.

For specific information or further advice related to application and products mentioned in this document, contact the Technical Department of Sika Industry.

2 INTRODUCTION

Sikasil® WT adhesives are silicone-based products suitable for bonding insulating glass units or glass panes into a window frame. Typical window frame materials are PVC, anodized and coated aluminum, painted and glazed wood. Sikasil® WT silicone adhesives have structural capabilities in terms of stiffening the window sash and are long-term UV-resistant. They have proven their suitability in thousands of produced windows and under various climatic conditions.

The Sikasil® WT adhesives are not certified to be used for Structural Glazing applications (SSG).

3 DESIGN, JOINT DIMENSIONING AND COMPATIBILITY

Joints must be properly dimensioned as changes are no longer possible after assembling and installation or adhesive application, respectively. Basis for joint dimensioning are the technical values of the adhesive, the adjacent building materials, the exposure of the building elements, their construction and size as well as external loads (wind, temperature), etc.. Improper joint dimensioning can cause excessive stress on the adhesive and/or the substrate, which could result in a bond failure.

Typical window bonding designs:

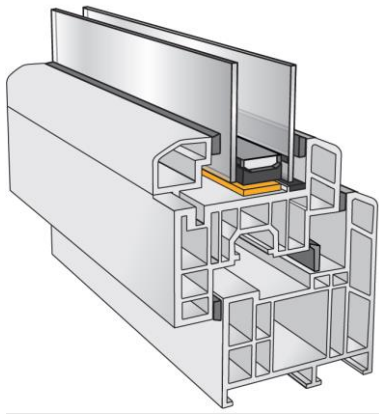


FIGURE 1 Rebate bonding

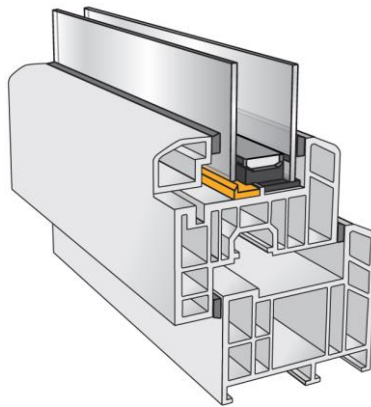


FIGURE 2 Glass edge bonding

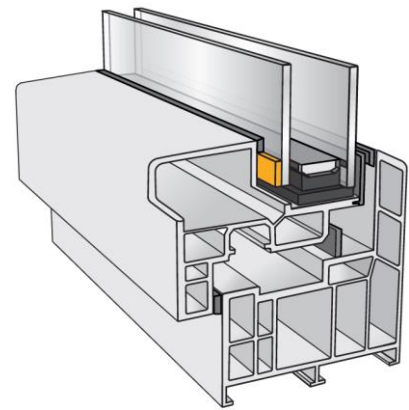


FIGURE 3 Overlap bonding

The minimum recommended adhesive thickness for Sikasil® WT silicones is 3 mm.

For proper curing of the adhesive access of humidity and air circulation must be guaranteed.

For 1-component Sikasil® WT the maximum joint width / depth must be limited to 15 mm, respecting the access to humidity and air circulation.

3.1 COMPATIBILITY IN WINDOWS

The mechanical properties of Sikasil® WT adhesives and insulating glass secondary and primary sealants may change as a result of plasticizer migration when in direct or indirect contact. This might cause impairment of operation or visual deficiencies. For this reason, only tested and accepted combination of insulating glass sealants and Sika products must be used in case of rebate or glass edge bonding.

It is the obligation of the window manufacturer to request the approval from Sika and in parallel from the insulating glass manufacturer or secondary / primary sealant manufacturer.

For more information use the Sika Sealant Compatibility Check: www.sika.com/ffi-compatibility-checker

To exclude materials influencing Sikasil® WT adhesives, all materials such as gaskets, setting blocks, sealants, etc., in direct and indirect contact must be approved by Sika in advance.

3.2 INSULATING GLASS UNIT QUALITY

Size tolerances, sealant protrusions and sheet misalignment have a direct effect on the gap for adhesive application and glass fitting. It is therefore advisable to define the required quality in a suitable delivery agreement with the glass manufacturer.

4 WORKING PLACE CONDITIONS

The working place must be as dust-free as possible. Ideal conditions are 23 °C and 50 % relative humidity. As these conditions are usually attainable only in laboratory, the plant conditions should be as close as possible. Although Sikasil® WT adhesives may be processed within 5 °C – 40 °C, the optimum application temperature is between 15 °C and 25 °C.

All substrates and sealants / adhesives must never be exposed to direct sun radiation, rain, snow or other direct weathering impacts and must be stored under the same conditions (i.e. 5 °C – 40 °C) at least 24 hours prior to the application of Sikasil® WT.

5 SURFACE PRE-TREATMENT

The substrates quality has a major influence on the long-term performance of adhesive applied on.

Surfaces must be clean, dry and free from oil, grease, release agents and dust. Do not contaminate pre-treated surfaces during any phase of production. If contamination occurs, surfaces have to be cleaned again.

The information in Table 2 about the pre-treatment of surfaces serve as a guideline only and must be verified by tests on original substrates. Specific pre-treatment recommendations, based on laboratory tests, are available from Sika upon request.

Note that with the exception of clear float glass (clean, not treated), Sika has to test the adhesion of Sikasil® WT adhesives on original samples or representative samples produced in the identical way as the original substrates used in the final application.

The use of the surface pre-treatment agents recommended in the laboratory report is mandatory.

Table 2 Overview of suitable pre-treatments

Substrate	Surface Pre-treatment
Float glass (including tempered, toughened, laminated and tinted types)	Sika® Cleaner G+M or Sika® Cleaner P Sikasil® WT-66 PowerCure: Sika® Aktivator-205, Sika® Aktivator-205 LUM
PVC	Sika® Aktivator-205, Sika® Aktivator-205 LUM
Ceramic-coated (enameled) glass	Sika® Cleaner P & Sika® Aktivator-100
Anodized aluminum	Sika® Cleaner P or Sika® Cleaner P & Sika® Aktivator-100
Wood glazed / uncoated	Dust-free Sika® Primer-210
Wood painted / coated	Sika® Aktivator-205, Sika® Aktivator-205 LUM
Rebate bonding: Secondary sealant (PU, PS, Silicone)	Sika® Aktivator-205, Sika® Aktivator-205 LUM

Remarks: Sika® Aktivators and Sika® Primer leave a visible film on the pre-treated surfaces and can change the appearance of the pre-treated substrates. If this is not acceptable, use masking tape to protect the visible areas.
For greasy, oily or strong polluted surfaces Sika® Cleaner G+M is recommended instead of Sika® Cleaner P.

5.1 APPLICATION OF Sika® Cleaner G+M AND Sika® Cleaner P

Sika® Cleaner G+M and Sika® Cleaner P are solvent-based cleaning agents. Both cleaners are used in the following way:

1. Moisten a clean, dry, oil-free and lint-free paper with Sika® Cleaner G+M or Sika® Cleaner P and apply it on the surface. Make sure to turn the paper to expose new surface or replace it regularly in order to avoid wiping any residues back onto the surface.
2. Immediately wipe-off the cleaner with a clean, dry, oil-free and lint-free paper before it dries. (If not removed the dissolved contaminants would remain on the surface)
3. Repeat this procedure until the surface is clean.
4. The required minimum flash-off time is 2 minutes at 5°C – 40°C on non-absorbing substrates.
5. If cleaned parts cannot be bonded immediately, protect them against subsequent contamination.

Adhesives or other pre-treatments need to be applied within 2 hours after the cleaning with Sika® Cleaner G+M and Sika® Cleaner P. Otherwise the procedure as described above must be repeated.

5.2 APPLICATION OF Sika® Aktivator-100 OR Sika® Aktivator-205 / Sika® Aktivator-205 LUM

Sika® Aktivator-100 and Sika® Aktivator-205 /-205 LUM are activating agents to pre-treat surfaces to improve adhesion and shall always be applied on substrates after they have been properly cleaned with Sika® Cleaner G+M or Sika® Cleaner P.

The mentioned activators are not a simple cleaning solvent but contain adhesion promoters. It leaves active groups on the substrate surface. On some surfaces, this pre-treatment may be visible and change the substrate appearance. Therefore, it is important in visual sensitive application areas to use masking tapes prior to the application of the activators.

1. Moisten a clean, dry, oil-free and lint-free paper with the activator and apply it on the surface. Make sure to turn the paper to expose new surface or replace it regularly to avoid wiping any residues back onto the surface.
 - In case of Sika® Aktivator-100: Immediately wipe-off the activator with a clean, dry, oil-free and lint-free paper before it dries.
 - In case of Sika® Aktivator-205 / Sika® Aktivator-205 LUM: The surface must not be dried subsequently with a paper towel.
2. The required minimum flash-off time are as follows (depending on the temperature in the workshop area):
 - $\geq 15^{\circ}\text{C}$: 10 minutes
 - $< 15^{\circ}\text{C}$: 30 minutes
 - maximum flash-off time 2 hours
3. Adhesives need to be applied within 2 hours after the application of the activators. Otherwise, the procedure as described above can be repeated only once before bonding.

If pretreated parts are not bonded or sealed immediately, protect them against subsequent contamination.

Tightly reseal container with the inner plastic liner immediately after each use. The activators shall only be used within one month after opening the can. Discard any activator that has become opaque instead of transparent, has yellowed, gelled or separated.

Sika® Aktivator-205 LUM can be visualized by activating the contained luminescent pigments using a light source with a wavelength of 320 – 420 nm. It is recommended to reduce foreign light such as sunlight or artificial light during the detecting process as well during storage before bonding. Exposure of the pre-treated surface to UV light will degrade the active substances on a faster scale. Luminescent effect will degrade with time.

5.3 APPLICATION OF Sika® Primer-210

Sika® Primer-210 shall always be applied after the surfaces have been properly cleaned and / or pre-treated with Sika® activators.

1. Pour a small amount of Sika® Primer-210 into a clean container.
Never dip any applicator into the original primer bottle.
2. Apply one thin but covering coat of Sika® Primer-210 with a foam applicator or a felt. Make sure that this single application gives adequately dense coverage. It is required that the primer layer is a complete, uniform layer.
3. The required minimum flash-off time are as follows (depending on the temperature in the workshop area):
 - $\geq 15^{\circ}\text{C}$: 10 minutes
 - $< 15^{\circ}\text{C}$: 30 minutes
4. The adhesives shall be applied within 2 hours after the application of Sika® Primer-210.

If pretreated parts are not bonded or sealed immediately, protect them against subsequent contamination. Apply Sika® Primer-210 once only. Priming process must not be repeated!

Tightly reseal container immediately after each use. Sika® Primer-210 shall only be used within one month after opening the can. Discard any primer that has become opaque instead of transparent, has yellowed, gelled or separated.

5.4 MASKING OF AREAS ADJACENT TO THE JOINTS

To assure neat bond lines and protect areas adjacent to the joint, use masking tape.

The tape must not touch the pre-treated surface areas to which the silicone has to adhere. After the tooling process remove the masking tape immediately or latest within the skin time, otherwise joints might be damaged.

6 PROCESSING AND PRODUCT APPLICATION

6.1 2-COMPONENT WINDOW BONDING ADHESIVES

6.1.1 WORKING WITH A PUMP SYSTEM

6.1.1.1 Preparatory work

Sikasil® WT A-component as well as B-component have a paste-like consistency. To process the two components, a pump system with follower plate is required.



As part of the quality control for the incoming materials, before placing any new drum / pail of A-component or B-component under the pump, it is recommended to check the pot life (snap time) of the manual mixed material (see Section 7.5), ensuring the correct mixing ratio, **directly** from drum / pail.

Check the Additional Technical Information (ATI) for preventing air entrapment while processing / mixing of 2-part silicone ensuring proper adhesion and material performance of a cured structural silicone joint [I].

High viscose 2-component silicones don't require stirring of A-component nor B-component because both components show very little tendency to separate. In the very unlikely case of oil separation of more than 1 cm on the B-component contact the Technical Department of Sika Industry before use.

1. After opening the 200 liter drum containing the A-component (base) remove all the plastic cover sheets and place the drum under the follower plate.
2. After opening the pail containing the B-component (catalyst) cut the foil in a diameter of approx. 150 mm. Remove cut foil and any crust or oil from the surface. Place the pail under the follower plate.

Due to its reactivity with atmospheric moisture, the B-component of all Sikasil® WT products must not be exposed to air for more than 5 minutes. Should a thin layer of a resinous material have developed on top, it has to be removed with a spatula or a similar tool before installing the container under the pump.

3. Start operations carefully following the instructions of the equipment supplier.

6.1.1.2 Mixing

To obtain the ultimate physical properties indicated in the corresponding Product Data Sheets, Sikasil® 2-component silicone adhesives must be thoroughly mixed by a 2-component silicone mixing and dispensing equipment with static or dynamic mixers. For recommendations contact the Technical Department of Sika Industry.

For mixing ratio by weight and volume, refer to the corresponding Product Data Sheet. Only small deviations of $\pm 10\%$ from the mixing ratio indicated in the Product Data Sheet are tolerated. For a proper adjustment of the mixing ratio refer to the manual of the pump equipment. If further assistance is required, contact the equipment manufacturer.

Lot matching of Sikasil® WT A-component (base) and B-component (catalyst) is not required.

The mixer open time, which is the time the material can remain in the mixer without flushing or extrusion of the product, is significantly shorter than the pot life (snap time) indicated in the Product Data Sheets. If the alarm time is set too long cured rubber particles are visible in the extruded material. To maintain a long lifetime of the mixer, the alarm on the equipment has to be set to the values shown in Table 5, chapter 9.2, page 21.

Detailed description of how the mixer open time can be determined is provided in the ATI: Mixer Open Time for 2-component Sikasil® [II].

The mixer life time and condition can be checked by performing both butterfly test and snake test described in Section 7.3 and 7.4 respectively.

It is recommended to check the mixer open time by butterfly test (see Section 7.3). The mixer open time is the maximum time the material can remain in the mixer without flushing or extrusion, which ensures no visible wrinkles and cured rubber particles in the butterfly test. The alarm time shall be set shorter than the measured mixer open time. Typical mixer open and alter times, tested at 23°C / 50% r.h. for each Sikasil® WT product are provided in this document.

During shutdown, it is recommended that the dispensing and mixing equipment is purged with non-catalyzed base (A-component) to retard the curing of the adhesive. Usually, the necessary amount of A-component to purge corresponds to the threefold volume of the mixing system (for systems with a static mixer).

Alternatively, a freezer can be used for downtimes up to 24 hours at a temperature of -40°C or below. However, the reaction will not stop at -40°C but will only be slowed down.

During prolonged production breaks additional flushing with a cleaning agent such as Sika® Mixer Cleaner is recommended. Cleaning the mixer by burning the silicone residues is not advisable.

When restarting production after shutdown, mixed silicone must be purged until obtaining a homogeneous mixture. Depending on the equipment, minimum 1 liter of Sikasil® WT sealant is needed for that purpose if static mixers are used. The quality of mixing and the correctness of the mixing ratio must be checked (see marble test, butterfly test, snake test and mixing ratio by weight in Chapter 7, "Quality Assurance").

6.1.2 WORKING WITH DUAL CARTRIDGES

If the material is processed out of the double-side cartridge, a pneumatic dispenser is required. To achieve the required product performance, the correct ratio of A- and B-component and a homogenous mixing must be ensured. The mandatory steps for the processing are described in application guideline: ATI: 2-component Sikasil® silicone adhesive application by cartridge [III].

6.1.3 APPLICATION

Sikasil® WT 2-component silicone adhesives must be applied evenly and free of air bubbles.

Tooling and smoothing of joints should be carried out as soon as possible after the adhesive application and not later than half of the snap time indicated in the relevant Product Data Sheet.

For Sikasil® WT products no tooling agents must be used.

6.1.4 OPEN TIME

The following information regarding open time is offered for general guidance only. The mentioned times significantly vary with different temperatures and must be verified by tests under actual conditions.

Table 3 Open times of 2-component Sikasil® WT adhesives at 23 °C / 50 % r.h.

Product	Open time Maximum time between application and joining of parts
Sikasil® WT-470	25 min
Sikasil® WT-480	10 min
Sikasil® WT-485	3 min

6.2 1-COMPONENT WINDOW BONDING ADHESIVES

6.2.1 WORKING WITH A PUMP SYSTEM

6.2.1.1 Preparatory work

1. Before installing the drum or pail into the pump equipment, cured material under the follower plate have to be removed thoroughly.

As part of the quality control for the income materials, before placing any new drum / pail of A-component or B-component under the pump, it is recommended to check the Skin time (see section 7.6, page 16)

2a Pails: After opening the pail cut the foil in a diameter of 150 mm. Remove cut foil from the surface.

2b Drums: After opening the drum cut the foil along the welding line. Pull the bag over the drum rim and tape it tightly. Remove the foil from the surface.

3. Put container under the pump and start application according to pump manufacturer's instructions.

All 1-component Sikasil® WT adhesives cure with atmospheric moisture. These products must not be exposed to air for more than 5 minutes.

6.2.2 WORKING FROM CARTRIDGES OR UNIPACKS:

Unipacks should be opened in a way, ensuring optimum quality of the applied adhesive, and avoiding issues. Therefore, refer to the ATI: Unipack opening [IV].

Follow the instructions given by the gun manufacturer.

6.2.3 APPLICATION

The adhesive must be applied evenly and free of air bubbles. The 1-component products form a skin after a certain time (skin time, skin-over time), which varies with ambient humidity and temperature. The joint bite for 1-component Sikasil® WT adhesives is limited to 15 mm in one curing step.

For proper curing of the adhesive access of humidity and air circulation must be guaranteed.

Joining of elements must be done before the adhesives builds a skin (skin time). It must be ensured that the joint is completely filled.

Tooling and smoothing of joints must be carried out as soon as possible after the adhesive application and not later than half of the skin time indicated in the relevant Product Data Sheet.

For Sikasil® WT products no tooling agents must be used.

6.3 POWERCURE - BOOSTERED 1-COMPONENT WINDOW BONDING ADHESIVE

To ensure a fast curing, independent of air humidity, the 1-component adhesive is mixed homogenously with an accelerator paste (booster).

In order to obtain the physical properties indicated in the corresponding Product Data Sheet, Sikasil® WT-66 PowerCure must be dispensed with the PowerCure Dispenser.



FIGURE 4 PowerCure Dispenser

6.3.1 GENERAL

Before using the PowerCure Dispenser, watch the “Get Started Video Tutorial” online on

<https://www.sika.com/getstartedwithpowercure>

<https://www.sika.com/powercure>

All unipacks designed for PowerCure must not be opened manually!

The mixers and nozzles must be ordered separately.

Store mixers and unipacks separately to avoid accidental piercing of the unipacks by the mixer.



FIGURE 5 PowerCure unipack (Sikasil® WT-66 PowerCure) full and empty – check for usage of accelerator (booster)

6.3.2 APPLICATION

1. If using a fresh unipack of Sikasil® WT-66 PowerCure, the initial approx. 50 g of the adhesive bead might be unboostered and may contain air inclusions!
Start- / stop the dispensing for five times to get rid of the air inclusions.
If the material must be fully boosted from start, purge approx. 50 g before starting the application
2. The parts must be joined within the open time of Sikasil® WT-66 PowerCure (see Product Data Sheet).
The open time depends mainly on the temperature, i.e. the higher the temperature the shorter the open time.
3. The mixer must be changed if no material has been applied for 10 minutes (mixer open time) to avoid cured material and ensure a good mixing quality.
4. One mixer could be used for 2 unipacks, if they are processed directly after each other and the mixer open time (10 minutes) was not reached.
5. Check each empty unipack, if the booster was fully used (booster pipe must be completely empty).
6. In order to ensure a long lifetime of the PowerCure Dispenser, do not process the PowerCure Dispenser on full speed without cutting the round nozzle.
7. If the unipack is not completely used, the material can remain in the PowerCure Dispenser for 3 days. For continuing the application, a fresh mixer and nozzle must be used!

For Sikasil® WT products no tooling agents must be used.

7 QUALITY ASSURANCE

Perfect results require carrying out each processing step perfectly. Sika therefore recommends that applicators install a quality control system. Quality control is the primary responsibility of the processor, but Sika will assist customers in setting up a comprehensive program and train staff to carry out the mandatory tests.

The following sections describe quality procedures and a schedule when to run these tests. Local and regional regulations may require a different quality control scheme.

Sika provides a lab case containing all tools required for the QC procedures described in these guidelines. Figure 6 shows the tools in the lab case. The figures are indicated in the guideline text behind in square brackets.



Figure 6: Pocket lab / Lab case for quality control

7.1 TESTING THE MIXING RATIO (2-COMPONENT PRODUCTS ONLY)

The easiest and recommended way to check the mixing ratio is by weight.

1. In normal mixing and metering systems, the two components can be fed separately via special valves.
2. The balance [2] have to be as accurate as 0.1 g
3. Pump both components simultaneously. To achieve maximum accuracy, extrude at least 0.3 liter of component A.
4. Weigh the components and calculate the mixing ratio.
5. For the correct mixing ratio refer to the corresponding Product Data Sheet.



If the ratio by weight is outside the $\pm 10\%$ range, stop working! Adjust the mixture to the required ratio before continuing. In case of problems with setting the mixing ratio, please contact the equipment manufacturer.

7.2 MARBLE TEST FOR HOMOGENEITY (2-COMPONENT PRODUCTS ONLY)

The marble test is used to check homogeneity of the mixture and it is particularly recommended in applications with high aesthetical demand.

1. Apply a cone of mixed 2-component Sikasil® WT adhesive on a clean float glass plate.
2. Press a second glass plate onto the plate with the adhesive. Avoid air bubbles!



If you see white or deep-black stripes or distinct light-gray marbling, the adhesive is not properly mixed or an insufficient amount of material was discharged after the last shutdown. Never use such material for bonding. To eliminate the defect, follow the equipment manufacturer's instructions. If a static mixer is used, it may have to be cleaned or replaced.



Figure 7: Positive test = ideal mixing



Figure 8: Negative test = inadequate mixing

7.3 BUTTERFLY TEST FOR HOMOGENEITY (2-COMPONENT PRODUCTS ONLY)

The butterfly test is used to check the homogeneity of the mixed material to ensure its ideal properties.

1. Fold a paper or plastic foil along its center and open it again.
2. Apply a bead of mixed Sikasil® WT 2-component adhesive along the fold, moving from one edge to the opposite; the amount has to be equivalent to the volume of the mixers used.
3. Fold the foil again and press it so that the silicone adhesive spreads out. Always press the foil in the direction perpendicular to the fold.
4. Unfold the paper.
5. The silicone adhesive must have a homogeneous color and must not show cured particles (wrinkles).



If you see white or deep-black stripes or distinct light-gray marbling or wrinkles, the adhesive is not properly mixed or an insufficient amount of material was discharged after the last shutdown. Never use such material for bonding. To eliminate the defect, follow the equipment manufacturer's instructions. If a static mixer is in use, it has to be cleaned or replaced.

6. After an adequate curing time, double-check the mixing quality by cutting open the thicker center section of the adhesive and check it for streaks, marbling and bubbles.



Use of the butterfly test is recommended to check the mixer open time (see Section 6.1.1.2). In order to check lifetime and conditions of the mixer, it is recommended to use the butterfly test in combination with the snake test.



Figure 9: Apply the bead in the fold direction



Figure 10: Press the bead only in direction perpendicular to



Figure 11: Unfold the foil - Positive test = ideal mixing



Figure 12: Unfold the foil - Negative test = inadequate

Further information regarding butterfly test is provided in the ATI: Mixer Open Time for 2-component Sikasil® [II].

7.4 SNAKE TEST (2-COMPONENT PRODUCTS ONLY)

The snake test is used to verify pump mixing quality and allows detecting inconsistent cure, soft spots and inhomogeneous areas of mixed 2-component Sikasil® WT adhesives and may provide evidence that pump maintenance is required.

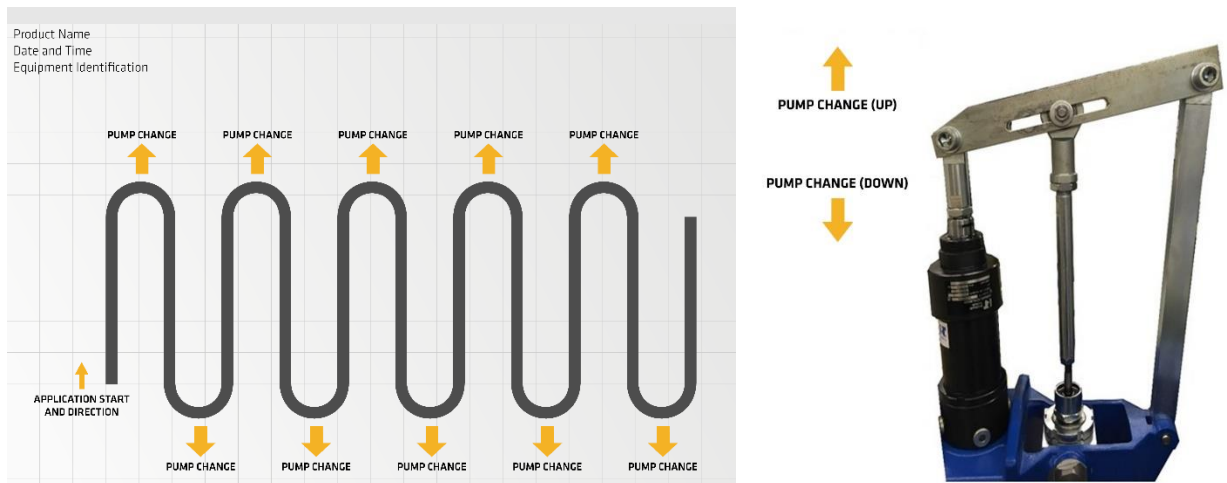


Figure 13: Schematic, application of snake test

1. Apply a continuous “snake-shaped” bead at least 10 mm thick of 2-component Sikasil® WT adhesive on a cardboard.
 Allow the pump to extrude for an amount of adhesive equivalent to at least 5 times the volume of A-component pump. Both the pump change on the top position (pump change up) and the pump change on the bottom position (pump change down) must be recorded on the sample as shown on the picture above (c.f. Figure 13). When the pump change occurs, the equipment releases an audible sound, and the applicator should turn the direction on the bead giving it the characteristic “S” look like a snake.
2. Record the application starting point and direction, product name, date and time and the equipment used. For this test 2 people are recommended, one writing the information and one performing the application.
3. Let the adhesive cure for at least 3 hours.
4. Press every 10 mm with a gloved finger or spatula along the applied bead to check the status of curing of the mixed material and its homogeneity.
 Record the information on the cardboard of differences occurred on the applied bead, like in the example below. A picture of the results should be taken.

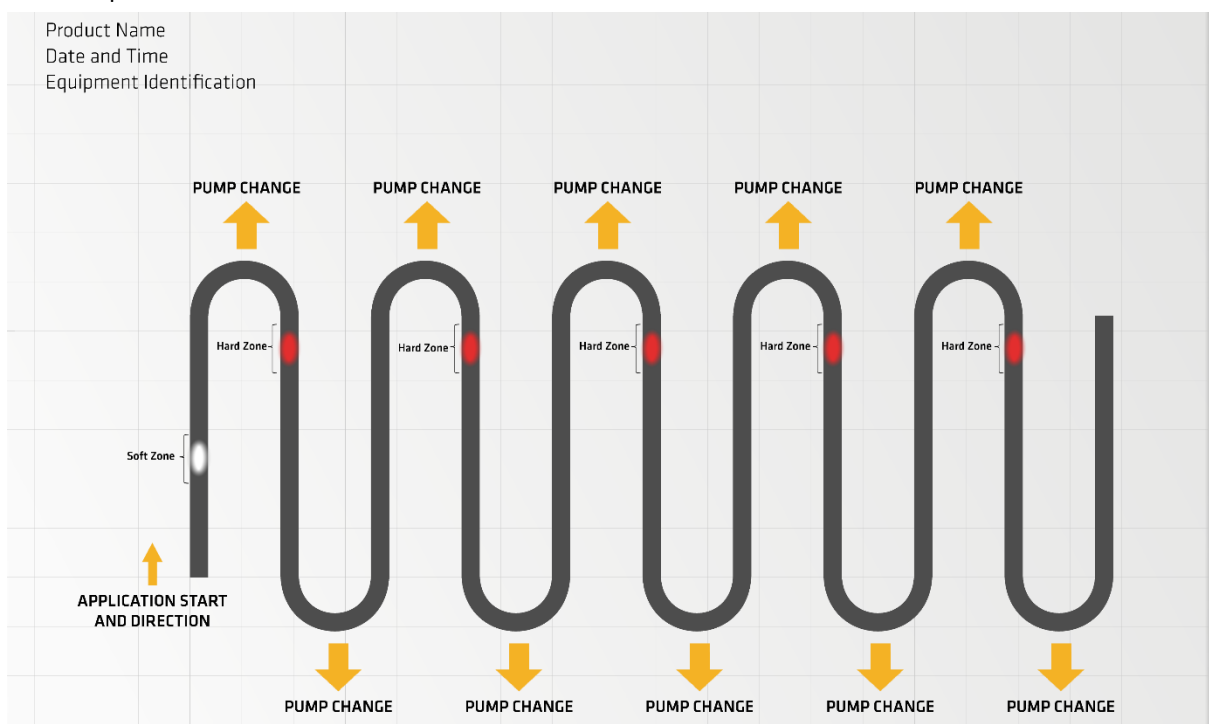


Figure 14: Schematic snake test, example for hard and soft spots which are not OK.



Soft spots or hard spots are a result of mixing ratio variation. If the variation is too high, the application equipment is not dosing the product consistently and pump adjustment is required.

Soft spots usually occur with consistent pattern or length along the bead; never use such material for bonding. To eliminate the defect, follow the equipment manufacturer's instructions or contact the pump supplier.

If a static mixer is in use, it must be cleaned or replaced.

5. Wait 24 hours after the application.
6. Repeat step 4 "Press every 10 mm with a gloved finger or spatula along the applied bead".
 - a. If the bead no longer shows soft / hard spots, then the silicone has cured.
 - b. If soft and harder spots can still be detected, it most likely affects the mechanical properties and adhesion of the applied Sikasil® WT silicone.
 - c. If the material is still distinctively softer or even tacky (wet), then immediate maintenance is required on the machine, the silicone adhesive on the applied façade element must be removed and the element must be re-bond again.
7. Use a sharp knife cut the bead section along its length and check the material conditions; the silicone must have a homogeneous color and must show uniform curing.



If white or deep-black stripes or distinct light-gray marbling is found, the adhesive is not properly mixed or dosed and pump maintenance is required. Never use such material for bonding. To eliminate the defect, follow the equipment manufacturer's instructions or contact a pump supplier.

If a static mixer is in use, it must be cleaned or replaced.



Figure 15: White stripe in material, inhomogeneous mixing



Figure 16: Severe white stripe in material, inhomogeneous mixing

8. If the silicone beads cured homogeneously (no soft / hard spots and no traces of white or black lines are observed in / on the bead) after 24 hours then the snake test is positive.

7.5 POT LIFE / SNAP TIME TEST (2-COMPONENT PRODUCTS ONLY)

1. The pot life must be determined in two ways with similar results:
 - a. Pot life by hand mixing: Separately weigh the A- and corresponding B-component in the correct mixing ratio into a plastic cup (approx. 100 g). Stir it thoroughly with a wooden spatula [5] for 60 seconds by hand. Ensure to include all material into the mix, especially the one sitting on the wall of the plastic cup.
 - b. Pot life of Sikasil® WT material applied from pump out of mixer, extrude 30 - 75 ml freshly mixed 2-component silicone Sikasil® WT adhesive into a small plastic cup, e.g. made of polyethylene [4].

Both results (snap times) must be the same. If a difference is found, the equipment (mixer, hoses, etc.) must be maintained.

2. Start the timer [3].
3. After 25 minutes pull out the spatula quickly with its flat side perpendicular to the paste and stir the paste briefly.
4. Repeat this operation every 5 minutes.



If the vigorous stirring is repeated too often, especially at the beginning of the test, the build-up of mechanical strength is disturbed and simulates a longer pot life.

5. The pot life / snap time is the time from extrusion of the silicone adhesive until the point at which it no longer forms long strings (Figure 17) when the spatula is removed, but breaks off in short length (Figure 18).
6. The measured value must be in line with the typical quality control values, provided in Table 5, chapter 9.2, page 21

Note: The snap time strongly depends on the temperature of the material. Hand mixed material can have a slightly longer snap time than mixtures from the static mixer (approx. $\pm 10\%$).

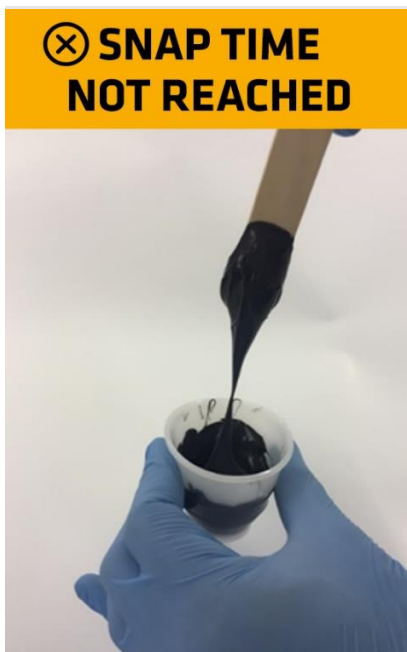


Figure 17: Material shows paste-like behavior: snap time not yet reached

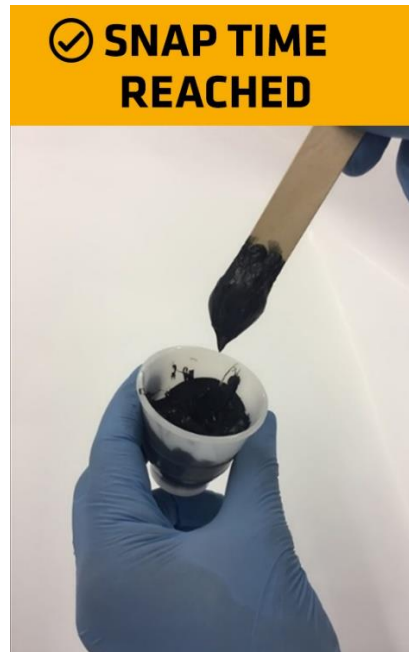


Figure 18: Material shows rubber-like behavior: snap time reached

7.6 SKIN TIME AND TACK-FREE TIME (1-COMPONENT PRODUCTS ONLY)

With 1-component silicone adhesives, check the skin time and tack-free time as follows:

1. Apply with a spatula about 30 g of the adhesive to paper or film in a thickness of about 3 to 4 mm and start timer [3].
2. Test every three minutes whether the adhesive surface has changed by probing with a clean fingertip.

Skin time is the point at which the adhesive no longer sticks to the finger (Figure 19 - Figure 23).

Tack-free time is the point at which the surface feels dry (no longer tacky).



The skin time and tack-free time given in the Product Data Sheets were determined under standard climatic conditions (23°C, 50% r.h.). Higher temperature and higher humidity reduce the skin time and tack-free time.

If there are drastic deviations (more than $\pm 50\%$) from the values given in the certificate of analysis or Table 5, chapter 9.2, page 21, stop bonding and consult the Technical Department of Sika Industry.

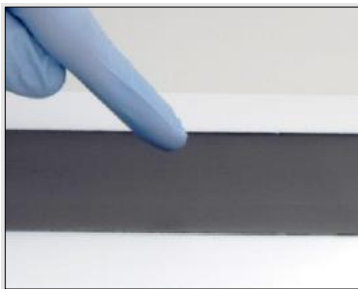


Figure 19: Start at the beginning of the bead

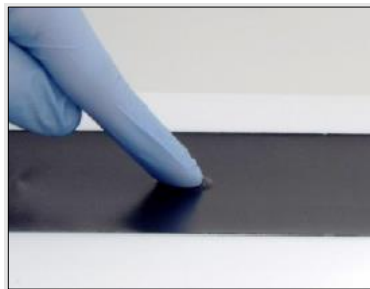


Figure 20: Touch slightly the bead with the finger

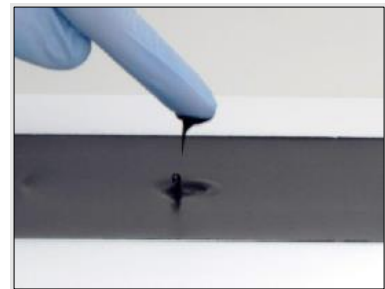


Figure 21: Remove and check for residues

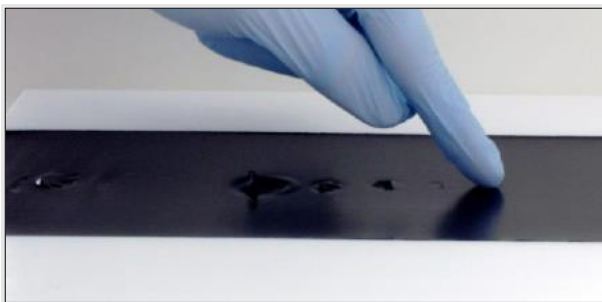


Figure 22: Always change the position for the next test

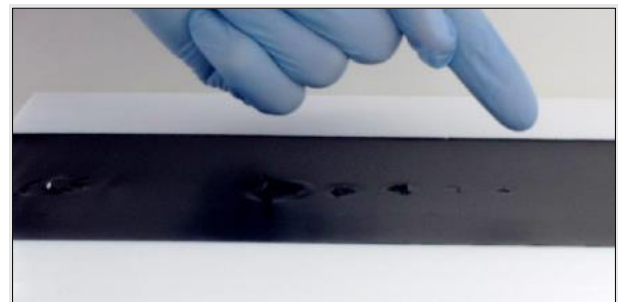


Figure 23: If no residues on your fingers are recognized the skin-over time has been reached

7.7 SHORE A HARDNESS

Check the Shore A hardness according to ISO 868 using a conventional trailer pointer device [9]. The test specimens must have a smooth, flat surface and a thickness of at least 6 mm. Use a doctor blade [6] for finishing the applied bead at the right seal height. This Shore A hardness measurement is an indication of a correct mixing ratio and speed of total curing. The minimum acceptable Shore A hardness of specific Sikasil® WT adhesives after 24 hours at room temperature (2-component adhesives) and 72 hours at room temperature (1-component adhesives) respectively is indicated in Table 5, chapter 9.2, page 21.

Note: Temperature – and for 1-component products also humidity – have a significant influence on the curing speed of condensation-curing silicone adhesives, actual Shore A hardness values may vary with factory conditions.

7.8 PEEL ADHESION TEST

1. Extrude a bead of Sikasil® WT adhesive of at least 150 mm length onto a clean substrate of original material (pre-treatment exactly as in production line).
2. Draw a template / doctor blade [6] over the bead to ensure its uniform size (about 15 mm wide and 6 mm high).
3. Store the test specimens at room temperature for 24 hours (2-component products) and 72 hours (1-component products), respectively.
4. Carry out the test by cutting approx. 30 mm of one end of the bead from the substrate with a sharp knife or glass scraper [7].
5. Fold back the loose end at an acute angle of about 30° (Figure 20) and try to detach the cured rubber from the substrate.
6. If the cured silicone cannot be detached, use the knife or glass scraper to cut it through to the substrate (Figure 21) several times while still pulling.
7. Repeat this procedure until at least 75 mm of the bead length has been tested.

After 24 hours (2-component products) and 72 hours (1-component products) respectively, the bead must not detach from the substrate during pulling (i.e. 90% cohesive failure).



Figure 24: Peel adhesion test: pulling the bead apart, result: 100% cohesive failure



Figure 25: Peel adhesion test on enameled glass: cutting the bead while pulling

7.9 VISUAL INSPECTION

Each bonded window / element shall be inspected visually to avoid mistakes in installation and adhesive application. The following criteria shall be checked for each window:

- Correct joint dimensioning according to the drawings and joint dimension calculation
- Complete joint filling according to drawings, eventually deglazing necessary
- No bubble inclusions and marble defects in the joint
- Correct installation of gaskets, setting blocks, dead load support (if applicable).

7.10 DEGLAZING

Deglazing should be carried out before moving the bonded windows to the jobsite or when the adhesive has cured completely throughout. Sika can support to determine the number of units to be tested and frequency of deglazing tests. The window must be deglazed following the recommendations of the system suppliers.

1. Pull the adhesive tab out of the joint. As per peel test described in Section 8.8, fold back the bead end at an acute angle of 30° and try to detach the cured material from the substrate.

The adhesive must tear at least 90% cohesively and therefore not detach from either of the two surfaces. The adhesive must not show any air bubbles.

2. Inspect thru-cure of joint and mixing quality.
3. Check the joint dimensions. Notify the relevant technical person in charge immediately if the joint dimensions do not match the definitions in the drawing.



Figure 26: Good adhesion, deglazing test positive



Figure 27: Adhesive failure, deglazing test negative

8 REPAIR GLAZING

1. Cut out the insulating glass unit: Use a sharp knife, vibration cutter or similar tools to separate the insulating glass unit from the sash profile.

Perform deglazing test or cut the adhesive back without damaging the surfaces of the frame or glass.

2. The temperature of the frame material and the insulating glass to be bonded must be at least 3 °C higher than the dew point temperature.

3. Substrate preparation: The surfaces must be clean, dry, and free of dust, oil, grease and dirt.

4. Pre-treat the surfaces (frame and glass) following chapter 5 accordingly.

Bonding on trimmed, remaining Sikasil® WT adhesive surface is possible if the same Sikasil® WT adhesive as the original one for the re-bonding is used. If bonding on Sikasil® WT adhesive is done, no pre-treatment must be used. The bonding is done on the particle free, remaining, fresh cut out Sikasil® WT adhesive

5. Joining the parts: Place the insulating glass unit into the window frame. Fit the spacer blocks according to the specifications.

6. Re-Bonding: Apply Sikasil® WT adhesives from single cartridge (for 1-component products) or dual cartridge (for 2-component products) or PowerCure Dispenser as specified for the window system.

The bonding adhesive beads must be tooled immediately.

7. Installation: Allow Sikasil® WT 2-component and PowerCure adhesives to cure for at least 72 hours before operating the window. Sikasil® WT 1-component adhesives must be fully cured before operating the window. During this time do not open, bend, or twist the window, nor expose it to any stress to allow the adhesive to built-up proper adhesion and mechanical strength. It is recommended to fix the glass into the frame by glazing blocks or distance holder to minimize movement of glass units.

In any case, the above glass repair guideline **may vary due to the specific window design and adhesive used.**

General Guideline

Window Bonding Sikasil® WT Adhesives

February 2024, Version 10

General-Guideline-Sikasil_WT_Adhesives_CORP-en-02-2024-V10

18/22

Sika Services AG

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BUILDING TRUST



9 TRANSPORTATION - MOVEMENT OF BONDED WINDOWS

Sikasil® WT 1-component adhesives must be fully cured before transport and installation.

The build-up of adhesion and strength of Sikasil® WT 2-component and PowerCure adhesives requires at least 24 hours at 23 °C / 50 % r.h. This is a general statement and depends on the window design, the type of substrate and the ambient conditions. During this time, the adhesive joint must not be exposed to any loads (e.g. no bending, no twisting, no moving).

The time to transport and installation of the bonded window can be shortened if:

- The adhesion build-up on the substrates used is finalized and the mechanical values reach the required performance level.
- The window system is not exposed to any mechanical loads and movements – no stress acts on the adhesive (e.g. glass is fixed additionally with setting blocks).

In case of doubts mechanical supports (e.g. setting blocks, spacers) must be used to prevent mechanical stress on the adhesive joint. Whenever possible, the window frame and the window sash should be transported together to provide additional protection and stability to the bonded window.

9.1 RECOMMENDED BASIC QUALITY CONTROL SCHEME

The quality control of the bonding process is an essential part of the production process of a window and must be designed accordingly. The quality control scheme therefore must reflect the manufacture procedure, the type and function of the adhesive and fit to the bond line applied. The following scheme for a factory quality control is a proposal of such quality control tests which are important to review the quality of the adhesive / bond line applied.

Table 4: Scheme for factory quality control

Test	Chapter	Substrate	Frequency	Remark and Details
Mixing ratio by weight	7.1	n/a	daily before start of production and each time base (A) or catalyst (B) are changed	Only for 2-component products
Snap time / Pot life	7.5	n/a	daily before start of production and each time base (A) or catalyst (B) are changed	Only for 2-component products, required values only valid for 23°C
Butterfly test	7.3	n/a	daily before start of production and at restart after base purge and each time base (A) or catalyst (B) are changed	Only for 2- component products
Snake test	7.4	n/a	regularly and after any kind of adjustment of pump and mixing equipment	Only for 2-component products
Skin time	7.6	n/a	Each time a new batch is used	For 1-component and boosted products Values only valid for 23°C / 50 % r.h
Shore A hardness	7.7	n/a	2-component adhesive Each time base (A) or catalyst (B) are changed. Boostered (PowerCure) and 1-component adhesive each batch	After 24 hours (2-component and boosted adhesives) at 23 °C / 50 % r.h. Or 72 hours (1-component adhesives) at 23 °C / 50 % r.h.
Peel Adhesion	7.8	Glass*, Frame*, Rebate bonding: secondary sealant	2-component adhesive Each time base (A) or catalyst (B) are changed 1-component and boosted (PowerCure) adhesive each batch	After 24 hours (2-component and boosted products) or 72 hours (1-component products) in the factory (same conditions as bonded elements are stored)
Visual Inspection	7.9	Window	Every unit produced	Check for: complete joint filling according to drawings; bubble inclusions in the joint; setting blocks, dead load support (if applicable); etc.
Deglazing	7.10	Window	The first unit and every e.g. 500 unit produced	Check for: complete joint filling according to drawings; bubble inclusions in the joint; setting blocks, dead load support (if applicable) and adhesion.

* For peel adhesion test use substrates originally used in the window production.

9.2 QUALITY CONTROL REQUIREMENTS OF Sikasil® WT ADHESIVES

The following table describe quality procedures and a schedule when to run these tests. Local and regional regulations may require a different quality control scheme.

Table 5: Quality control requirements of Sikasil® WT adhesives determined at 23°C / 50% r.h.

	Property / Test	Chap.	Sikasil® WT-470	Sikasil® WT-480	Sikasil® WT-485	Sikasil® WT-66 PowerCure	Sikasil® WT-40	Sikasil® WT-65
1	Mixer open time ¹⁾	..	5 – 7 minutes	8 – 12 minutes	2 – 3 minutes	≤ 10 minutes	n.a.	n.a.
2	Alarm time equipment ¹⁾	..	4 minutes	7 minutes	1 minutes	n.a.		
3	Mixing ratio by weight (A:B) by weight	7.1	11.7:1 to 14.3:1	11.7:1 to 14.3:1	10.8:1 to 13.2:1			
4	Snap time / pot life	7.5	35 – 70 min	35 – 50 min	5 – 20 min	10 - 20 minutes		
5	Butterfly test	7.3	No white or deep black stripes, no marbling, no wrinkles					
6	Snake test	7.4	No soft spots No white or deep black stripes, no marbling					
7	Skin time	7.6	n.a.			20 – 60 minutes	10 – 40 minutes	15 – 40 minutes
8	Shore A hardness	7.7	≥ 25	≥ 45	≥ 35	≥ 25	≥ 12	≥ 15
			After 24 hours at 23°C				After 72 hours at 23°C	
9	Peel adhesion	7.8	≥ 90% cohesive failure, after 24 hours (2-component products) or 72 hours (1-component and boosted products) in the factory (same conditions as bonded elements are stored)					
11	Visual Inspection	7.9	<ul style="list-style-type: none"> ▪ Complete joint filling according to drawings ▪ No air/gas inclusions / bubbles are allowed ▪ Joint dimensions correspond to drawings ▪ Accessories like setting blocks, dead load support or gaskets, must be installed according to drawings ▪ 90% adhesion on bonded substrates (90% cohesive failure of the joint) ▪ Homogenous joint curing, no soft spots, no white or deep black stripes 					
12	Deglazing	7.10						

Remarks: ¹⁾Above mentioned times significantly vary with ambient temperature, pump equipment and mixer set-up and **must be** verified by tests under actual conditions

n.a. = not applicable

For different climate conditions as 23°C / 50% r.h. the values provided in this table may vary

10 REFERENCES

Pos.	Source	Title / Link
[I]	Additional Technical Information	Sikasil® 2-part – SILICONE ADHESIVES Additional Technical Information for preventing air entrapment while processing / mixing of 2-part silicone ensuring proper adhesion and material performance of a cured structural silicone joint
[II]	Additional Technical Information	Mixer Open Time for 2-component Sikasil®
[III]	Additional Technical Information	2-component Sikasil® silicone adhesives application by cartridge
[IV]	Additional Technical Information	Unipack opening

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