GENERAL GUIDELINE
Insulating Glass Edge Sealing with Sikasil® IG sealants

10.11.2023 / VERSION 4 / SIKA SERVICES AG

TABLE OF CONTENTS

1 PURPOSE AND GENERAL INFORMATION

Technical support for customers has always been a high priority at Sika. Driven by the use of new materials, stricter building regulations and an increasing decoupling of planning and execution in the globalized economy, our customers are finding that ensuring consistent delivery of complex projects in the construction industry is becoming increasingly challenging. Sika responds to the ever-growing complexity in the construction industry with the BONDING EXCELLENCE quality program. Sika`s BONDING EXCELLENCE quality program is a set of process steps and tools that supports applicators of sealants and adhesives in their task of producing and delivering façades, using Sika`s reliable and certified Sikasil® products.

Visit our website http://www.sika.com/industry and check Sikas BONDING EXCELLENCE quality program: http://www.sika-bonding-excellence.com [I]

This document contains recommendations and hints for the application of Sikasil® IG sealants as secondary edge sealing of dual-sealed insulating glass units. This guideline is relevant for the products listed in Table 1.

Table 1: Overview of Sikasil® IG sealants

Product name	Certified according to or complying with	1- or 2-component silicone SSG adhesives
Sikasil® IG-25 HM Plus	EOTA ETAG 002 part 1, EN 1279 ASTM C1369, ASTM C1184 CEKAL and SNJF VI-VEC recognized	2-component
Sikasil® IG-25	EOTA ETAG 002 part 1, EN 1279 ASTM C1369, ASTM C1184 CEKAL and SNJF VI-VEC recognized	
Sikasil® IG-25 S	ASTM C1369, ASTM C1184	
Sikasil® IG-16	EN 1279	1-component

Sikasil® IG sealants in highly demanding and critical applications, such as structural glazing in insulating glass may only be used after a detailed examination and written approval of the corresponding project details by the Technical Department of Sika Industry.

The information herein is offered for general guidance only. Since structural sealant glazing is a 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.

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® IG sealants are condensation-curing, 1- and 2-component silicone products suitable for secondary edge seals of dual-sealed insulating glass units. Since silicones are the only materials with a long-term resistance to UV radiation and with structural capabilities in the sense of EN 13022, EAD 090010-00-0404 (EOTA ETAG 002 part 1) or ASTM C 1249, they are commonly used in structural glazed façades or structurally bonded windows and have proven their suitability in thousands of façade projects under various climatic conditions.

3 DESIGN AND JOINT DIMENSIONING

The secondary edge sealant joint of an insulating glass unit must be designed to withstand all loads the element is exposed to during its service life, such as wind, snow, climatic loads etc. The required silicone height of an insulating glass unit thus strongly depends on the dimensions of the glass panes, the IG unit composition (glass thickness and cavity) and the expected loads.

A minimum silicone seal height of 6 mm according to EOTA ETAG 002 part 1 is mandatory for silicone-sealed insulating glass units used in structurally glazed façades. The required silicone seal height for a certain application can be significantly larger though. Sika offers a comprehensive project service package including design reviews and joint dimensioning.

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, one shall make the plant conditions as close as possible. Although Sikasil® IG adhesives may be processed within 5°C – 40°C, the optimum application temperature of the products is between 15°C and 30°C. These limits apply to the temperature of Sikasil® adhesives, the substrates as well as the ambient air.

The temperature of the substrates to be bonded must always be at least 3°C higher than the dew point temperature of the air to reduce condensation risk.

All substrates and 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® IG.

5 SURFACE PRE-TREATMENT AND MASKING

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 must be cleaned again.

The information in Table 2 is offered for general guidance only. Advice on specific pre-treatment methods based on laboratory adhesion tests will be given on request.

With the exception of clear float glass, it is mandatory that the adhesion of structural silicone adhesive is tested on project basis on production-run samples of the original materials before real production starts. With reference to e.g. glass substrates, adhesion tests have to be performed on samples which are equal in terms of coating type, coating edge deletion, edge cutting, etc. The quality of edge deleted glass strongly depends on e.g. grinding wheel type, pressure, revolving speed, etc.

It is responsibility of the IG manufacturer to identify and submit the relevant project substrates to Sika laboratory for adhesion testing, to implement a strict quality control during production of the IG units to monitor and confirm adhesion performance and to recognize any change in substrate quality that needs adhesion re-testing.

The use of the surface pre-treatment agents recommended in the project specific Sika Technical Service Report is mandatory.

Preliminary surface cleaning by Sika® Cleaner P or Sika Cleaner® G+M is mandatory before application of any primer or activating agent.

If detectable pre-treatment agents are required, luminescent versions of Sika® Aktivator-205, namely Sika® Aktivator-205 LUM can be used. Adhesion results obtained by Sika® Aktivator-205 can be extended to Sika® Aktivator-205 LUM and vice versa.

Table 2: Overview of suitable pre-treatments

Substrate	Surface Pre-treatment
Float glass – including tempered, toughened, laminated and tinted types	Washing machine Washing machine + Sika® Cleaner P
Float glass – including coated and/or edge deleted	Washing machine Washing machine + Sika® Cleaner P
Ceramic-coated (enameled) glass	Washing machine + Sika® Aktivator-100 Washing machine + Sika® Primer-790

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.

Table 3: Overview of suitable pre-treatments for **U-profile inserts** embedded into the secondary seal or IGU spacer, if required

Substrate	Surface Pre-treatment
Anodized aluminum	Sika® Cleaner P or Sika® Cleaner P + Sika® Aktivator-100
Stainless steel	Sika® Cleaner P + Sika® Aktivator-100 Sika® Cleaner P + Sika® Primer-790
Polyester powder-coated or PVDF-coated aluminum	Sika® Cleaner P + Sika® Aktivator-205 or Sika® Cleaner P + Sika® Primer-790
Polyamide	Sika® Aktivator-205 Sika Primer-209 D

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 P AND Sika® Cleaner G+M

Sika® Cleaner P and Sika® Cleaner G+M 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 P or Sika® Cleaner G+M 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 P and Sika® Cleaner G+M. 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 P or Sika® Cleaner G+M.

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):
   - ≥ 15°C: 10 minutes
   - < 15°C: 30 minutes
   - maximum flash-off time 2 hours

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

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.

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-790

Sika® Primer-790 shall always be applied after the surfaces have been properly cleaned. If the surface is not clean, proper cleaning with Sika® Cleaner P or Sika® Cleaner G+M is mandatory.
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 primer.

1. Pour a small amount of Sika® Primer-790 into a clean container.
   Never dip any applicator into the original primer bottle.
2. Apply one thin but covering coat of Sika® Primer-790 with a clean, dry, oil-free and lint-free paper towel or foam applicator. Make sure that this single application gives adequately dense coverage. It is required that the primer layer is a complete, uniform layer.
3. Let the primer flash-off for at least 20 minutes at 23°C / 50% r.h.. Colder temperatures might require longer flash-off time.
4. The adhesives shall be applied within 2 hours after the application of Sika® Primer-790.

If pretreated parts are not bonded or sealed immediately, protect them against subsequent contamination. Apply Sika® Primer-790 once only. Priming process must not be repeated!

Tightly reseal container immediately after each use. Sika® Primer-790 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 APPLICATION OF Sika® Primer-209 D

Sika® Primer-209 D is a black primer and shall be applied on clean Polyamide surfaces. If the surface is not clean, proper cleaning with Sika® Cleaner P or Sika® Cleaner G+M is mandatory.

1. Shake Sika® Primer-209 D thoroughly - at least for 2 minutes. The container includes a steel ball, which must be clearly heard while shaking. When the ball sound is heard, keep shaking for at least 1 minute longer.
2. Pour a small amount of Sika® Primer-209 D into a clean container.
   Never dip any applicator into the original primer container.
3. Apply one thin but covering coat of Sika® Primer-209 D 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.
4. Let the primer flash-off for at least 10 minutes at 23°C / 50% r.h.. Colder temperatures might require longer flash-off time.
5. The adhesives shall be applied within 2 hours after the application of Sika® Primer-209 D.

If pretreated parts are not bonded or sealed immediately, protect them against subsequent contamination. Apply Sika® Primer-209 D once only. Priming process must not be repeated!

Tightly reseal container immediately after each use. Sika® Primer-209 D shall only be used within one month after opening the can. Discard any primer that gelled or separated.

5.5 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 TWO-COMPONENT INSULATING GLASS SECONDARY SEALANT

6.1.1 PREPARATORY WORK

Sikasil® IG 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 income 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 8.5), 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 [VIII].

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.

1a. 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.

2a. 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.

Low viscose 2-component silicones like Sikasil® IG-25 S require a slightly different procedure, as follows:

1b. B-component: separation of up to 3 cm might be found and requires remixing. Follow ATI remixing of B-component [IX], including QC ensuring a bubble free remixed B-component.

2b. A-component: after opening the 200 liter drum, remove all the plastic cover sheets, fold the inliner in the center and add an round plastic plate with 20 to 23 cm opening in the center, on top of the material, preventing leakage of the A-component. Cut the foil in the center and place the drum under the follower plate. Follow ATI processing of lower viscos Sikasil® A-component [X], including QC ensuring a bubble free remixed B-component.

Due to its reactivity with atmospheric moisture, the B-component of all Sikasil® IG products must not to be exposed to air for more than 5 minutes. Should a thin layer of a resinous material have developed on top, it must 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.

6.1.2 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 ± 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® IG 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 8.15, page 27.

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

The mixer life time and condition can be checked by performing both butterfly test and snake test described in Section 8.3 and 8.4 respectively.

It is recommended to check the mixer open time by butterfly test (see Section 8.3). 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 alert times, tested at 23°C / 50% r.h. for each Sikasil® IG 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 must be avoided.

When restarting production after shutdown, mixed silicone must be purged until obtaining a homogeneous mixture. Depending on the equipment, minimum 1 liter of Sikasil® IG 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 8, “Quality Assurance”).

6.1.3 APPLICATION

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

Tooling of the joint should be carried out as soon as possible after adhesive application but not later than half the pot life (snap time) indicated in the relevant Product Data Sheet.

It must be ensured that the joint is completely filled and that the joint dimensions correspond to the calculated values.

Treatments with detergent, soap and water or any sort of untested tooling agents are not allowed for tooling SG joints.

In stepped IG units, Sikasil® IG can be applied in thin layers for glass opacification. The adhesive can be applied on the stepped glass surface by a suitable spatula. A layer thickness of 2 mm must be ensured. Further recommendations on the application of opacification layer and required QC scheme are provided in the ATI Sikasil® IG opacification layer [III].

6.2 ONE-COMPONENT INSULATING GLASS SECONDARY SEALANT

6.2.1 PREPARATORY WORK

Working from drums or pails:

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

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® IG adhesives cure with atmospheric moisture. These products must not be exposed to air for more than 5 minutes.

Working from unipacks:

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

Follow the instructions given by the gun manufacturer.

6.2.2 APPLICATION

Sikasil® IG adhesives are applied by equipment with a metering pump, or manually directly from unipack.

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.

Tooling and smoothing of joints should 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.

It must be ensured that the joint is completely filled and that the joint dimensions correspond to the calculated values.

Treatments with detergent, soap and water or any sort of untested tooling agents are not allowed for tooling Sikasil® IG joints.

7 MOVEMENT OF INSULATING GLAS UNITS

Bonded units shall not be exposed to stress until certain adhesive strength has developed.

Forces applied to the IG unit before the secondary edge seal has cured, can compromise adhesion build-up, alignment of the glass panels, performance of the PIB primary seal as moisture / gas barrier and durability of the insulating glass unit.

Use adequate mechanical supports (compatible setting blocks) to prevent shear loads acting on the joints during storage, transportation and installation.

All packaging components for storage and transportation of the insulating glass units must be compatible with the secondary sealant.

Since adhesion and strength build-up depend on the adhesive used, environmental conditions and substrates respectively, no general recommendations regarding minimum time for moving the bonded units can be given. Depending on the factory conditions and organization of the production process, different times for the movement of bonded elements can be defined based on curing process and adhesion build-up.

If the secondary edge seal has a structural function in the sense of EN 13022, EAD 090010-00-0404 (EOTA ETAG 002 part 1) or ASTM C1249, the minimum time before transportation of the bonded units is 72 hours for 2-component and 21 days for 1-component secondary sealants.

Nevertheless, earlier transportation of the insulating glass units is possible if tensile adhesion tests on H-specimens (see chapter 8, “Quality Assurance”) kept under the same conditions as the bonded elements provide a tensile strength higher or equal to the limits. The relevant limits of the different Sikasil® IG adhesives are given in Table 5: Quality control requirements of Sikasil® IG secondary sealants, page 27.

The insulating glass units must not be moved to job site for installation or assembled in façade and fenestration components until the adhesive has fully cured and it can be demonstrated through quality control testing that the adhesive has achieved full adhesion.

.

8 QUALITY ASSURANCE

Sika requires that applicators of Sikasil® IG sealants used for secondary sealing of insulating glass units (IGU) implement a strict quality control (QC) system on the silicone sealants during the IGU production.
Indeed, perfect results in terms of final adhesion, mechanical and aesthetical performance of the bonded assembly require carrying out each processing step perfectly. Monitoring and controlling each step helps limiting potential damages and remedial costs.
This document proposes a QC scheme for applications of Sikasil® IG and Sikasil® SG secondary sealing joints in insulating glass units with structural function.
Test methods and QC procedures for applications of IG secondary sealing joints must always be compliant with the requirements set by relevant existing standards, such as:

- EN 1279-6 Glass in building – Insulating Glass Units – Part 6: Factory Production Control and Periodic Tests
- EN 1279-4 Glass in building – Insulating Glass Units – Part 4: Method of tests for the physical attributes of edge seal components and inserts
- EN 13022-2 Glass in building – Structural sealant glazing – Part 2: Assembly rules
- ASTM C1249 Standard guide for sealed insulating glass units for structural sealant glazing applications
- EAD 090010-00-0404 European Assessment Document for Bonded glazing kits and bonding sealants
- EOTA ETAG 002 part 1 Guideline for European Technical Approval for Structural Sealant Glazing Kits

Such list is only indicative and not exhaustive.
If the secondary seal has a structural function in the sense of EAD 090010-00-0404 (EOTA ETAG 002 part 1), EN 13022 or ASTM C1249, quality control scheme described in the following section can be used. Other local and regional regulations as well as critical applications may require a different quality control scheme and must be considered in addition. In such case, please contact the Technical Department of Sika Industry.

Quality control is sole and exclusive responsibility of the processor, who is responsible for the bonded assembly produced. Only IG units whose secondary sealing performance satisfy values and comply with the requirements set forth in the following section (or by specific QC scheme agreed with the Technical Department of Sika Industry) can be delivered to site for installation.

Sika provides a lab case containing all tools required for the QC procedures described in these guidelines. Figure 1 shows the tools in the lab case.

Movies of some QC tests described in Chapters 8.1 - 8.10 are available in onsika-bonding-excellence.com, section 08 – Training parts for applicators – Part 6: Quality Control.

Figure 1: Pocket lab / Lab case for quality control

8.1 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 ± 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.

8.2 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® IG 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 2: Positive test = ideal mixing

Figure 3: Negative test = inadequate mixing

8.3 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® IG 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 6.1.2).
In order to check lifetime and conditions of the mixer, it is recommended to use the butterfly test in combination with the snake test.

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

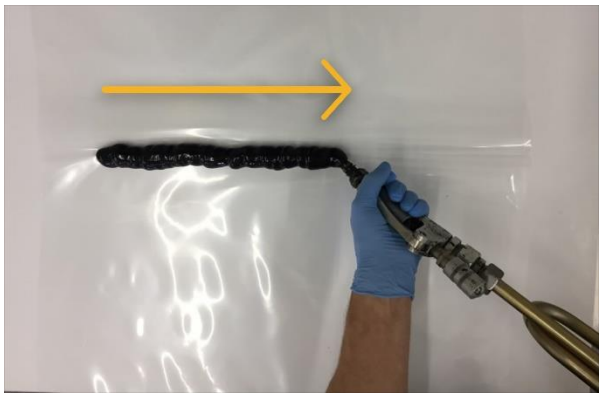

Figure 4: Apply the bead in the fold direction

Figure 5: Press the bead only in direction perpendicular to fold

Figure 6: Unfold the foil - Positive test = ideal mixing

Figure 7: Unfold the foil - Negative test = inadequate mixing

8.4 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® IG adhesives and may provide evidence that pump maintenance is required.

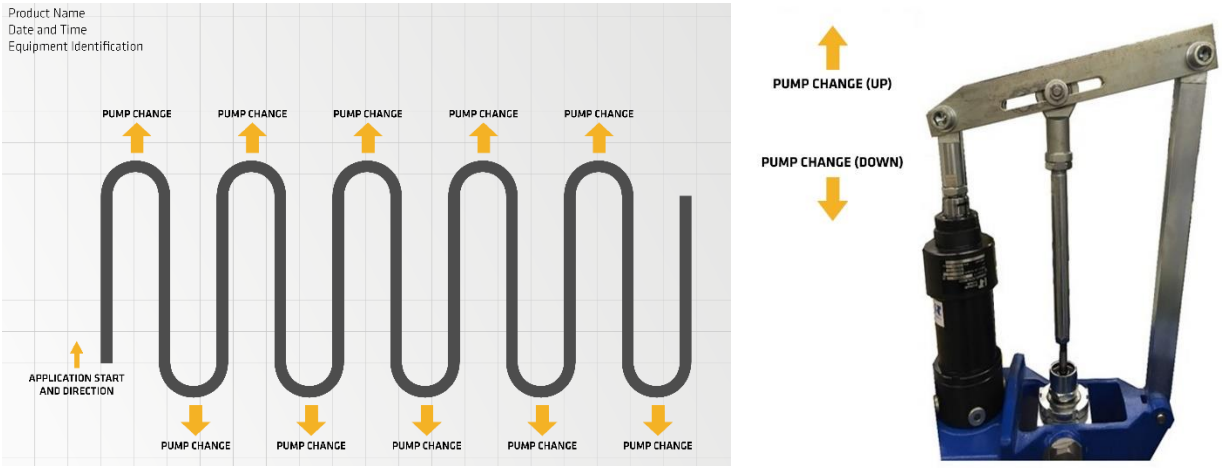

Figure 8: Schematic, application of snake test

1. Apply a continuous “snake-shaped” bead at least 10 mm thick of 2-component Sikasil® IG 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 8). 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” shape like a snake.
2. Record the application starting point and direction, product name, date and time and the equipment used.
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.
   On the carboard record what is observed along the applied bead, like in the example below. Take a picture of the results.

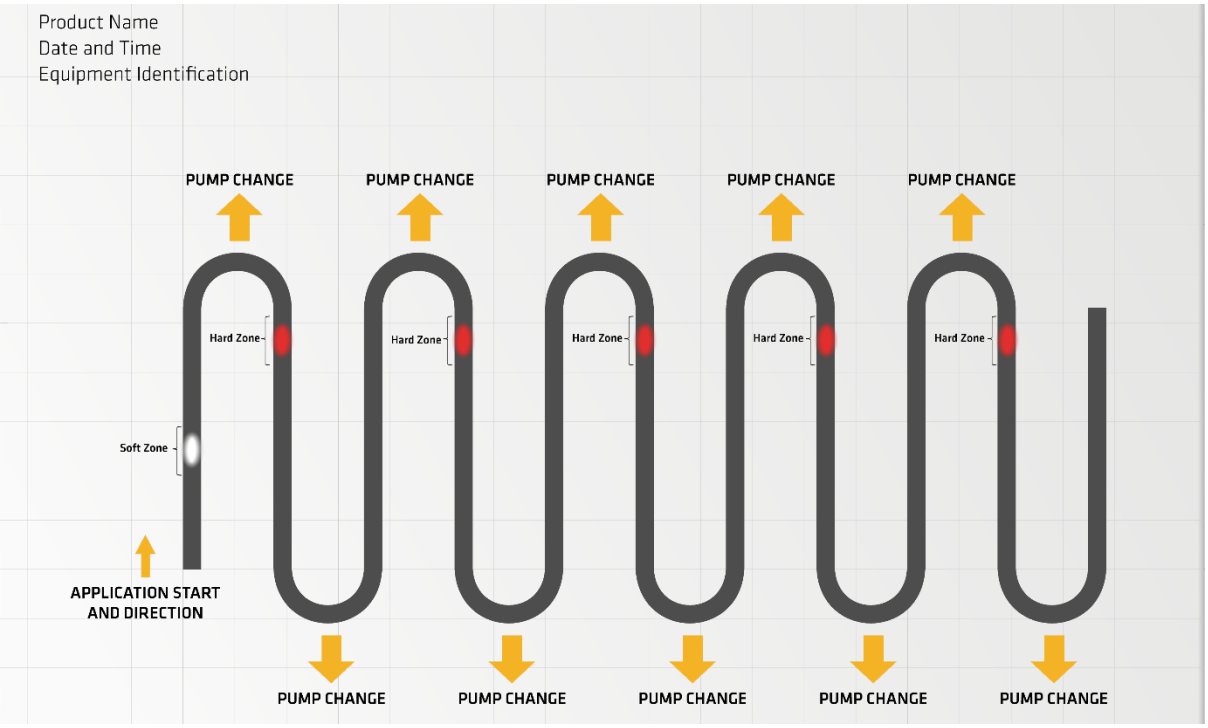

Figure 9: Schematic snake test, example for hard and soft spots which are not OK.

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 snake-bead application.
6. Repeat step 3 "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, they most likely affect the mechanical properties and the adhesion of the applied Sikasil® IG 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-bonded again.
7. With 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 10: White stripe in material, inhomogeneous mixing

Figure 11: Severe white stripe in material, inhomogeneous mixing

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

8.5 SNAP TIME TESTING (2-COMPONENT PRODUCTS ONLY)

Snap time by hand mixing:

1. Weigh separately the A- and B-component in the correct mixing ratio into a plastic cup (approx. 100 g).
2. 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.

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.

3. Start the timer [3].
4. After 25 minutes pull out the spatula quickly with its flat side perpendicular to the paste and stir the paste briefly.
5. Repeat this operation every 5 minutes.
6. The snap time is the time after hand-mixing of the silicone adhesive is completed until the point it no longer forms long strings (Figure 12) when the spatula is removed, but breaks off in short length (Figure 13).
7. The measured value must be in line with the typical quality control values, provided in Table 5, chapter 8.15, page 27

Snap time by pump extrusion:

1. Extrude 30 - 75 ml freshly mixed 2-component silicone Sikasil® IG adhesive into a small plastic cup, e.g. made of polyethylene [4].
2. 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.
3. Start the timer [3].
4. After 25 minutes pull out the spatula quickly with its flat side perpendicular to the paste and stir the paste briefly.
5. Repeat this operation every 5 minutes.
6. The snap time is the time from extrusion of the adhesive until the point it no longer forms long strings (Figure 12) when the spatula is removed, but breaks off in short length (Figure 13).
7. The measured value must be in line with the typical quality control values, provided in Table 5, chapter 8.15, page 27

The snap-time results by hand mixing and from pump extrusion must be in the same range (approx. ± 10%). If a greater difference is found, the equipment (mixer, hoses, etc.) must be maintained.

The snap time strongly depends on the temperature of the material.

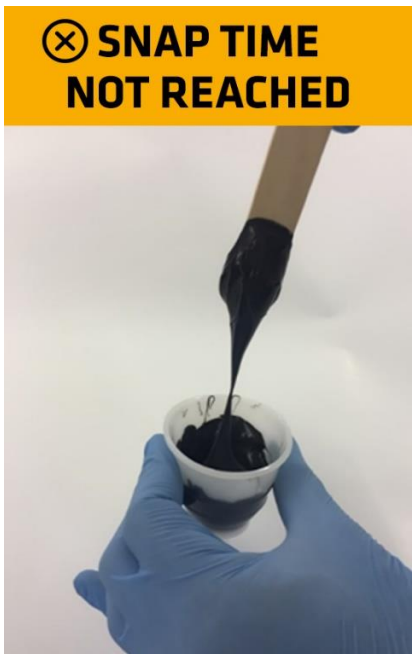

Figure 12: Material shows paste-like behavior: snap time not yet reached

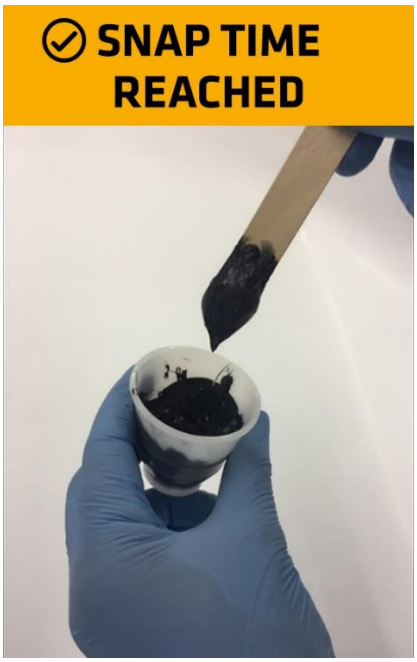

Figure 13: Material shows rubber-like behavior: snap time reached

8.6 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 adhesive on a 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 14 - Figure 18).

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 are 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 ± 50%) from the values given in the certificate of analysis or Table 5, chapter 8.15, page 27, stop bonding and consult the Technical Department of Sika Industry.

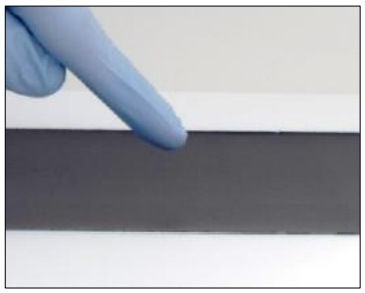

Figure 14: Start at the beginning of the bead

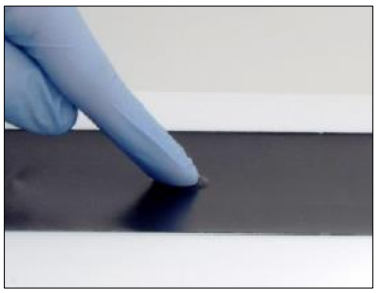

Figure 15: Touch slightly the bead with the finger

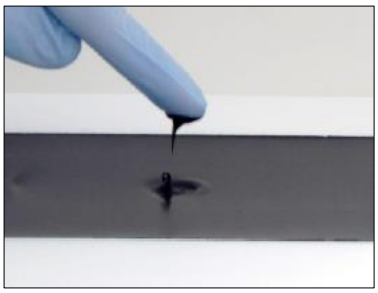

Figure 16: Remove and check for residues

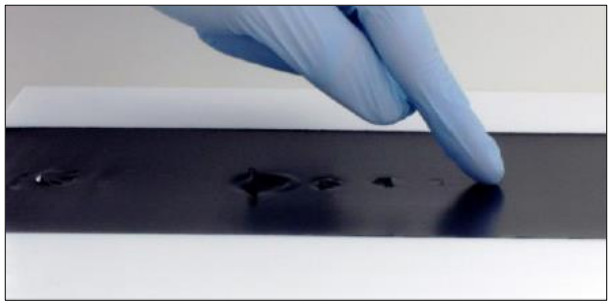

Figure 17: Always change the position for the next test

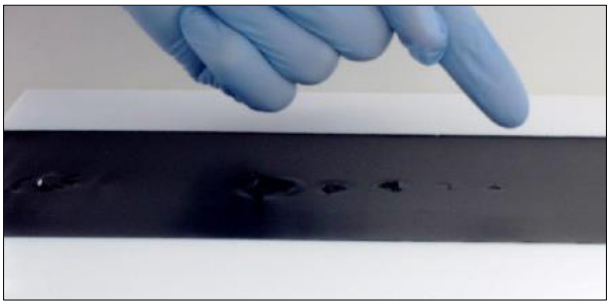

Figure 18: If no residues on your fingers are recognized the skin-over time has been reached

8.7 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® IG 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 8.15, page 27.

Note: Since 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.

8.8 PEEL ADHESION TEST

1. Extrude a bead of Sikasil® IG adhesive of at least 150 mm length onto a clean glass substrate, processed identically to the original material, e.g. edge deleted glass, enameled glass, coated glass etc. including cleaning / pre-treatment exactly like 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 silicone adhesive from the substrate.
6. If the cured silicone cannot be detached, use the knife or glass scraper to cut it through to the glass surface (Figure 20) 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. 95% cohesive failure).

Figure 19: Peel adhesion test: pulling the bead apart; result: 100% cohesive failure

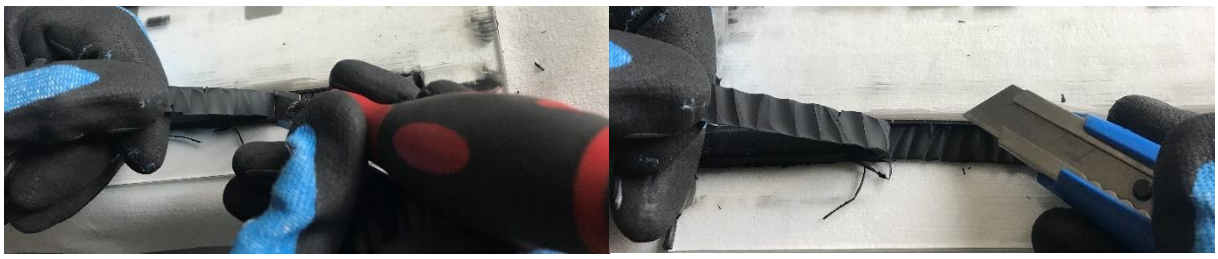

Figure 20: Peel adhesion test on enameled glass: cutting the bead while pulling

8.9 TENSILE ADHESION TESTS ON H-SPECIMENS

H-specimens with a joint dimension of 12 mm x 12 mm x 50 mm are produced for the tensile test. For this purpose, use original materials that have been pre-treated like on the production line.

1. Fix the glass and/or metal (use original material specified in project) test specimens to be bonded with spacers [8] and, if applicable, distance pieces (Figure 28, Figure 29) so that a joint measuring 12 mm x 12 mm x 50 mm can be filled.
   For 1-component adhesives wrap an e-PTFE tape around the spacers before assembly.
2. Prepare at least 2 bubble-free test specimens per test series with Sikasil® IG adhesive.
   Remove excess material with a spatula [5] or another tool.
3. Remove the molds from the test specimen after the recommend storage times, at production conditions (remove spacers, adhesive tape or clamps).
4. Determine the tensile strength after at least 72 hours for 2-component products or 21 days for 1-component products by means of a tensile testing equipment (pulling speed: 5 mm/min) or other suitable apparatus (see Figure 35)

If a tensile strength lower than the limits of the relevant Sikasil® IG adhesives, see Table 5, chapter 8.15, page 27 is attained, consult the Technical Department of Sika Industry before continuing. The failure mode must be at least 95% cohesive failure.

In absence of local standards, Sikasil® IG products shall meet the minimum values given Table 5, chapter 8.15, page 27.

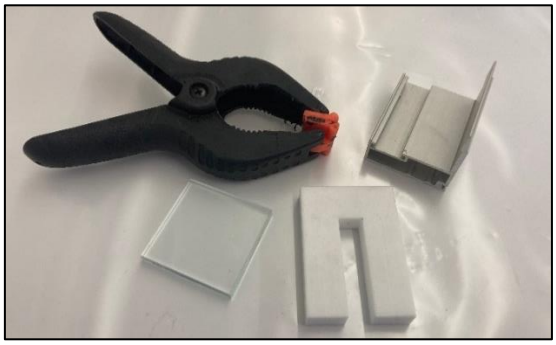

Figure 21: White, Teflon-Spacer (U-shape) and substrates glass and aluminum profile

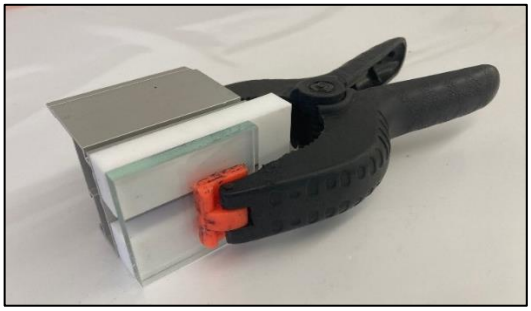

Figure 22: Assembled: white, Teflon-Spacer (U-shape) and substrates glass and aluminum profile

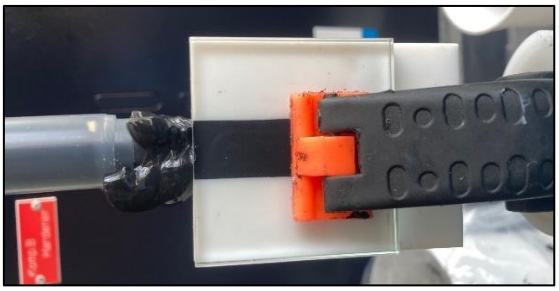

Figure 23: Fill the H-specimen completely with adhesive, avoiding air bubbles

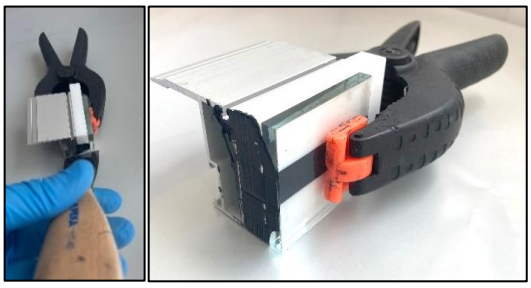

Figure 24: Remove excessive adhesive to ensure a proper, smooth and uniform adhesive surface

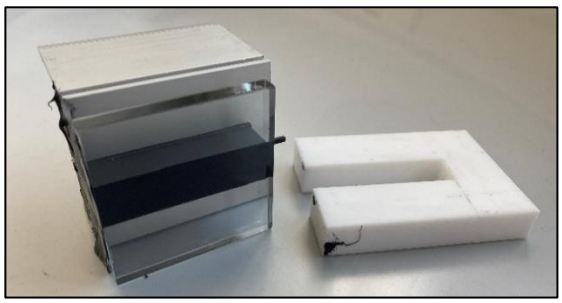

Figure 25: Remove the white, U-shaped Teflon-spacer after the relevant curing times (see above)

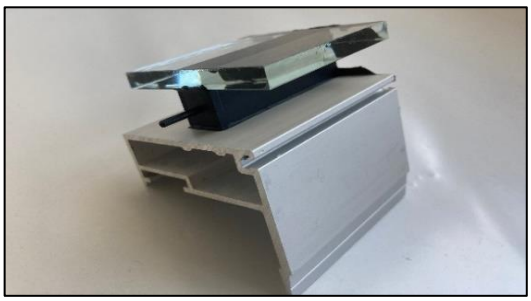

Figure 26: H-specimen (glass and aluminum profile) for tensile testing, determining maximum tensile strength.

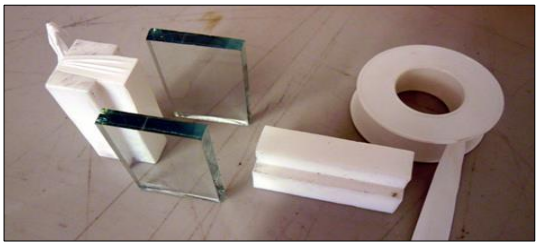

Figure 27: Alternative: white, Teflon-Spacers, with PTFE tape (tape necessary for 1-component adhesives) and substrate pieces (e.g. glass)

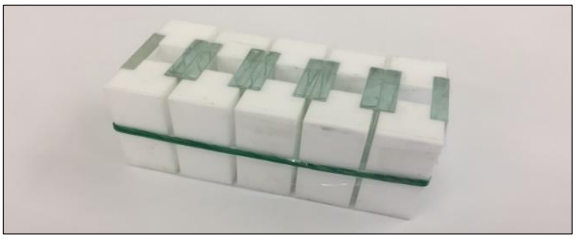

Figure 28: Arrangement and fixation of H-specimen with a rubber band and tape (transparent)

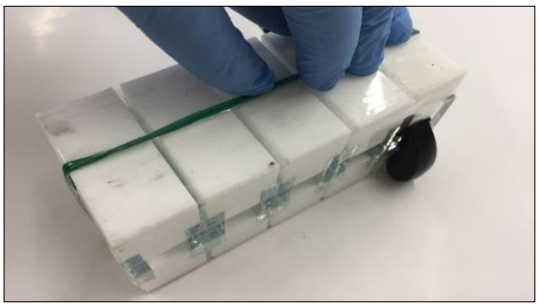

Figure 29: Completely filling of the H-specimens with adhesive, avoiding air bubbles

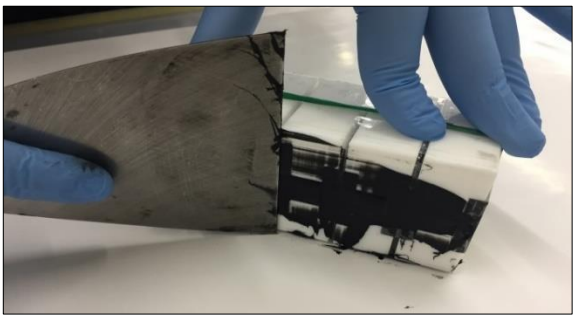

Figure 30: Remove excessive adhesive to ensure a proper, smooth and uniform adhesive surface

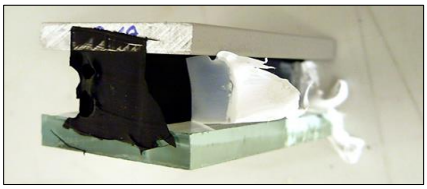

Figure 31: Remove spacers after 1 day,
remove e-PTFE tape after 7 days (1-component adhesives).

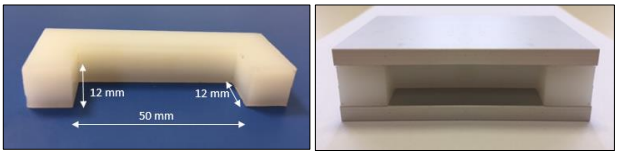

Figure 32: Alternative test arrangement
(suitable for profiles and 1-component adhesive)

Commercially available solutions for tensile testing equipment using screw driven system can be manually actuated or motorized. The minimum tensile force for H-specimen tests with Sikasil® adhesive must be 1000 N, with a tolerance of +/- 1 N. The grippers for the H-specimen devices might need to be custom-made as they are often not standard parts.

Note: Alternative equipment for testing H-specimens is shown in the ATI: Tensile test equipment for H-specimen of Sikasil® adhesives[V].

Manual test machine with digital force gauge
Vertical manual force gauges test stand - SADFGVSM3RD" by Samatools (https://www.samatools.it)

"Ban VEC" manual test bench with analog measurement (sold by GINGER CEBTP);

Figure 33: Manual tensile test stands with digital (left) or digital (right) force gauge

8.10 BOOK TEST

The book test is recommended in EN1279 part 6 (named butterfly tests). It provides information on adherence to glass (coated, edge deleted, enameled, etc.) under production conditions.

This test gives no information on the cohesive strength of the secondary sealant (see H-specimen test).

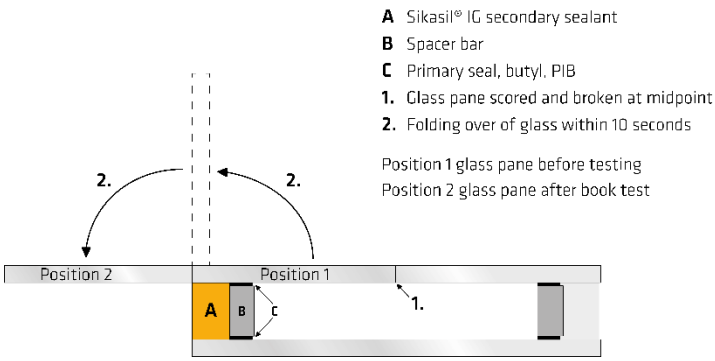

Figure 34: Book test

1. Assemble an IG unit in the production line, using the same process and glass substrate quality used in the project. The minimum size of the IG unit depends on washing machine and press of the production line.
2. Store the IG-unit in the same way as the project related IGUs until adhesive is fully cured.
   Usually the curing time at 23°C is:
   - 2-component Sikasil® IG secondary sealants: ≥ 72 hours.
   - 1-component Sikasil® IG secondary sealants: ≥ 21 days, depending on joint geometry.
3. Score the glass pane with a glass cutter and break it in the middle of the glass.
4. Bend the glass pane segments from position 1 to position 2 over a period of 10 seconds. Remember to use proper safety-gloves to avoid injuries or use a suitable jig.
5. No adhesion failure of the secondary sealant from the glass substrate is allowed.
   Note: This method tests only the adhesion to the glass surface. Due to high stresses applied, failure of the sealant to the spacer does not constitute failure of the system.

8.11 VISUAL INSPECTION

Each bonded element shall be inspected visually to avoid mistakes in installation and adhesive application. Minimum, the following criteria shall be checked for each panel:

- Correct joint dimensioning according to the drawings and calculations
- Complete joint filling according to drawings, eventually deglazing necessary (see 8.10)
- No bubble inclusions and marble defects in the joint
- Correct installation of spacers, U-profile inserts (if applicable), etc.
- Correct alignment of the glass panes
- Etc.

8.12 TEST ON PRODUCED IGUS

The original IGU must be tested regarding quality, to consider influencing production and material parameters.

The number of IGUs to be tested and frequency of tests on original units must be defined before project start.

A suggested frequency is:

- 1 IGU of the first 10 IGUs
- 1 IGU of the next 40 IGUs
- 1 IGU of the next 50 IGUs
- 1 IGU of every 100 IGUs
- 1 IGU of every 200 IGUs

Different (semi-) destructive test methods are provided below for testing of fully assembled IGUs.

It is the processors responsibility to check and apply one of the suggested test methods below that provides reliable results.

8.12.1 DEGLAZING

Deglazing of insulating glass unit is a destructive test used to check dimensions, filling and mixing quality of the secondary sealing joint and to test its adhesion with reference to the full-scale system produced. Deglazing shall be carried out when the adhesive has cured completely throughout, before moving the bonded elements to job-site for installation or to factory for assembling.

For deglazing a smaller, but **representative** size could be used (identical tread glass surface as in the original IGUs).

1. Using a sharp knife (e.g. Stanley or carpet knife), cut the cured secondary seal joint as close as possible to the glass interface opposite to the one's where adhesion needs to be checked; reach the PIB primary seal in order to detach it.
2. Continue cutting the secondary seal and detaching the PIB primary seal along the whole perimeter of the IG unit so that the glass pane can be completely removed.
3. Remove the IG spacer.
4. Cut approx. 30 mm of silicone bead left on the opposite glass. As per peel test described in section 8.8 Peel adhesion test, fold back the bead end at an acute angle of 30° and try to detach the cured material from the substrate. The adhesive must break 95% cohesively.
5. If the cured silicone cannot be detached, use the knife to cut it as close as possible to the glass interface several times while pulling.
6. Repeat this procedure until all bead length applied along the IG unit perimeter is tested.
7. Adhesive must not detach from the glass surface (no adhesion loss) and must not show any air bubbles, white or deep black stripes and soft spots. Inspect joint filling, thru-cure and mixing quality.
   Check the dimensions of the joint on the bonded substrate and compare with the values provided in the drawings and approved by Sika.
   Undertake corrective actions immediately if adhesion loss occurs, mixing defects are detected or joint dimensions do not match drawings and Sika requirements.
   Notify the Technical Department of Sika Industry.

Figure 35: Good adhesion, deglazing test positive

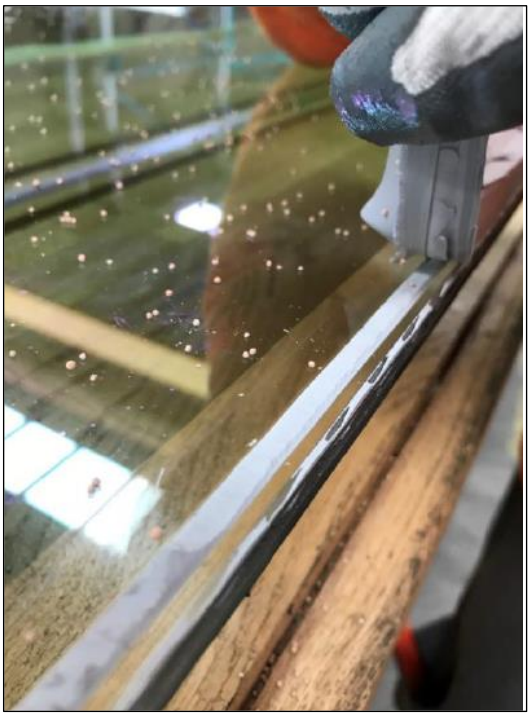

Figure 36: Adhesive failure, deglazing test negative

8.12.2 LOCAL ADHESION TESTS BY CHISEL CUTTING

1. Select an IGU for the test. The secondary sealing joints must be fully cured.
2. Perform the following test at least at two adjacent corners and in the middle of one side of the IG unit (Figure 37).
3. Choose a chisel with a width 1-2 mm smaller than the cavity width of the IG unit (Figure 38).

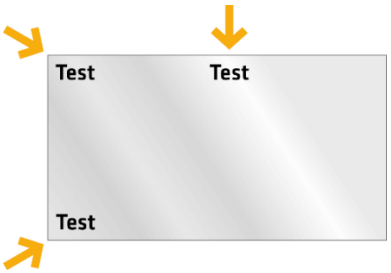

Figure 37: Test locations

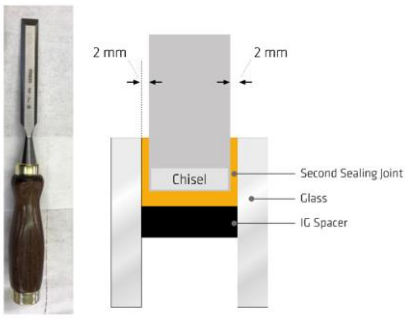

Figure 38: Chisel and chisel dimensions

4. Insert the chisel diagonally into the secondary sealant. Avoid damaging the glass surface. Do not cut completely through the secondary sealant and never touch the IG spacer (Figure 39).
5. Pull the chisel upward to remove a portion of the secondary sealant. If possible, look at the glass surfaces while performing this action (Figure 40).
6. Check the glass surfaces and the joint portion removed.
   Good adhesion is observed when the joint fails 100% cohesively and no silicone parts detach from both glass panes.

   Poor adhesion is observed when silicone detaches partially / completely from either one of the glass panes.

   If the removed secondary sealant shows a smooth shiny surface, it also confirms adhesion loss.

   If poor adhesion is detected, do not ship, and do not install the affected IG units.

   The following images show examples of pass/fail results as a visual reference.
7. As soon as the test on the IG unit is finished and good adhesion is observed, apply fresh secondary sealant (same Sikasil® IG adhesive as originally used) in the tested areas and tool the joint with a spatula for proper finishing.

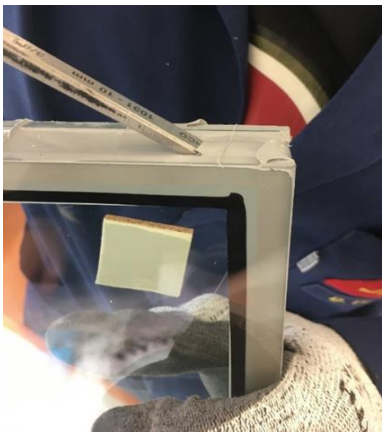

Figure 39: Insert the chisel diagonally

Figure 40: Pulling upwards the chisel

Figure 41: Pressing the chisel downwards

Figure 42: Adhesion on the inner side of the glass

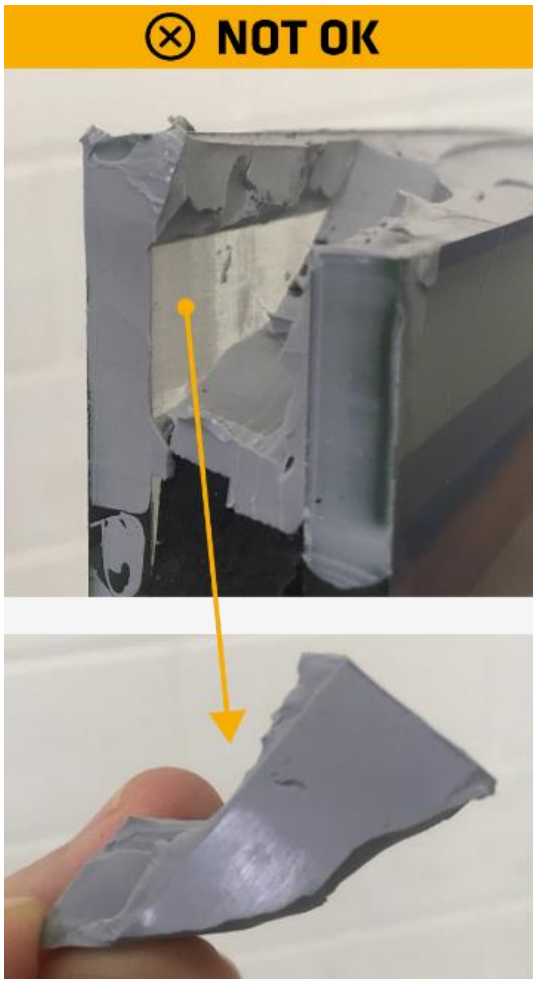

Figure 43: No adhesion on the inner side of the glass- Not OK

8.12.3 LOCAL ADHESION TESTS BY JOINT PRESSING

As alternative to the deglazing test (chapter 8.12.1), the following non-destructive test method can be used. It is suitable for testing adhesion in double glass units where the bonded surfaces are visible through the glass (i.e. not opaque). It is not suitable for checking adhesion in triple glazed units.

1. Select an IGU for the test. The secondary sealing joints must be fully cured.
   Press a blunt object (plastic of wooden, i.e. wooden spatula) into the secondary sealant. The tool must be blunt and thin to push it inside the joint as easy as possible.
2. Push the tool with some force into the secondary sealant joint and at the glass interface. Push at least up to 2/3 of the joint depth. Take care not to reach the IG spacer.
   Sika has developed a specialized tool for the test that can be 3D printed. The drawing is available at https://www.thingiverse.com/thing:6119488/files.
3. Inspect how the secondary sealant ruptures from the glass surface.
   a. Good adhesion is observed when a white line appears where the tool is being pushed in
   b. Poor adhesion is observed when air pockets are visible through the glass surface.
4. If poor adhesion is detected, do not ship and do not install the affected IG units.
5. If good adhesion is observed, remove with a cutting tool the secondary sealant of the tested region. Apply fresh secondary sealant (same Sikasil® IG adhesive originally used) in the tested area and tool the joint with a spatula for proper finishing.

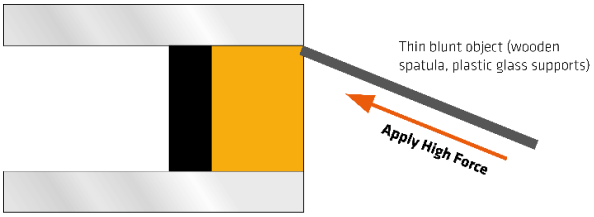

Figure 44: Joint pressing

Figure 45: Specialized tool drawing

Figure 46: Test procedure

. Figure 47: Adhesion on inner glass surface (OK)

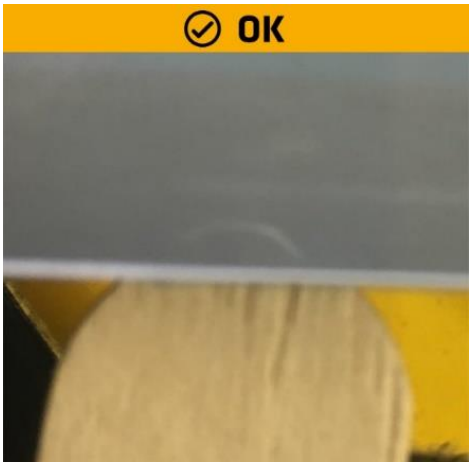

Figure 48: Result evaluation - Adhesion on glass surface (OK)

Figure 49: Result evaluation – Adhesion loss on glass surface (NOT OK)

8.13 RECOMMENDATIONS FOR LOGBOOK CONTENT

The production/quality control logbook for insulating glass secondary sealant should contain the following information:

General
- Project/job name
- Date
- Production line designation (if applicable)

Panel information
- IGU code
- Progressive number – indicate 1st unit after change of secondary sealant silicone base (A) or catalyst (B) change

Bonding Substrate and surface pre-treatment information
- Type of glass (e.g. float, edge deleted glass, coated glass, enamel coated, pyrolytic coating)
- Type of cleaning agent for the glass
- Material used for U-profiles into the secondary sealing if any
- Type of cleaning agent for the glass
- Type of cleaning for U-profiles into the secondary sealing joint if any
- Type of IG spacer
- Batch numbers and expiry dates for cleaning agents
- If applicable: type of primer or activator for glass / U-profiles / IG-spacer
- Batch numbers and expiry dates for Sika® Cleaner, Sika® Aktivator or Sika® Primer

Insulating glass secondary sealant Sikasil® IG silicone adhesive and Sika® Mixer Cleaner Information
- Type of structural silicone
- Batch numbers and expiry dates of secondary sealant silicone (A and B in case of 2-component products)
- Type of mixer cleaner (usually: Sika® Mixer Cleaner)
- Batch numbers and expiry dates for Sika® Mixer Cleaner

Factory conditions
- Temperature
- Relative humidity

Quality control results
- Mixing ratio in parts
- Snap time in minutes
- Skin-over time in minutes
- Butterfly test
- Snake test
- Shore A
- Peel adhesion
- Tensile adhesion
- Visual inspection
- Deglazing

All QC documents and relevant test samples (H-specimen, adhesion samples, etc.), must be properly stored for a minimum time equivalent to at least the guarantee duration.

8.14 RECOMMENDED BASIC QUALITY CONTROL SCHEME

The following table summarizes required QC tests and frequency. Local and regional regulations such as EN 1279, ASTM C1249 or EAD 090010-00-0404 (EOTA ETAG 002 part 1) may require a different quality control scheme.

Table 4: Scheme for factory quality control

Test	Section	Substrate	Frequency	Remark and Details
Mixing ratio by weight	8.1	n/a	Daily before start of production and each time base (A) or catalyst (B) are changed	Only for 2-component products
Snap time	8.5	n/a	Daily before start of production and each time base (A) or catalyst (B) are changed	Only for 2C adhesive
Butterfly test	8.3	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 2C adhesive
Snake test	8.4	n/a	Weekly and after any kind of adjustment of pump and mixing equipment	Only for 2C adhesive
Skin-over time	8.6	n/a	daily before start of production and each time a new batch is used	Only for 1- component products,
Shore A hardness	8.7	n/a	2x daily before start of production and each time base (A) or catalyst (B) are changed	After 24 hours (2C adhesives) or 72 hours (1-component adhesives) at 23°C / 50% r.h.
Peel Adhesion	8.8	Glass[1)]	1 specimen daily before start of production and each time base (A) or catalyst (B) are changed	After 24 hours (2C adhesive) or 72 hours (1C adhesive) in the factory (same conditions as bonded elements are stored)
Tensile Adhesion (H-specimen 12 mm x 12 mm x 50 mm)	8.9	Glass[2)]	2 specimens daily before start of production and each time base (A) or catalyst (B) are changed	After 72 hours (2C adhesive) or 21 days (1C adhesive) in the factory (same conditions as bonded elements are stored)
Book test (IG-butterfly test as per EN1279-6)	8.10	Glass [1)]	According to EN1279-6 or 1 specimen daily before start of production and each time base (A) or catalyst (B) are changed	After adhesive has cured completely throughout (2C adhesive) Alternative to deglazing (see above).
Visual Inspection	8.11	Original IG unit	Each IG unit	Check for: complete joint filling; bubble inclusions; marbling; material homogeneity, correct installation of spacer and U-profile inserts, alignment of glass panels, etc.
Deglazing Field adhesion test Local adhesion tests on IG units	8.12	Original IG unit	See chapter 8.12	Before moving the IG units to the client / job-site and when the adhesive has cured completely throughout. After adhesive has cured completely throughout (2C adhesive)

[1)] For testing **substrates must be equal to the ones used in the project** (e.g. in terms of coating type, enameled glass, edge deletion process, edge cutting, cleaning, etc.)

[2)] Glass substrate for tensile adhesion test can be float glass, if the adhesion on the original used substrate[1)] was tested by means of peel adhesion test and showing positive results.

8.15 QUALITY CONTROLL REQUIREMENTS OF SIKASIL® IG SECONDARY SEALANTS

The following table summarizes product-related QC requirements.

Table 5: Quality control requirements of Sikasil® IG secondary sealants determined **at 23°C / 50% r.h.**

	Property / Test	Section	Sikasil® IG-25	Sikasil® IG-25 HM Plus	Sikasil® IG-25 S	Sikasil® IG-16
1	**Mixer open time**[1)]	6.1.2	7 – 9 minutes	3 - 5 minutes	5 - 10 minutes	n.a.
2	**Alarm time equipment**[1)]	6.1.2	6 minutes	3 minutes	5 minutes	
3	**Mixing ratio by weight**	8.1	11.7:1 to 14.3:1	11.7:1 to 14.3:1	11.7:1 to 14.3:1	
4	**Snap time / pot life**	8.5	35 – 70 minutes	45 – 90 minutes	30 –70 minutes	
5	**Butterfly test**	8.3	No white or deep black stripes, no marbling, no wrinkles			
6	**Snake test**	8.4	No soft spots No white or deep black stripes, no marbling			
7	**Skin-over time**	8.6	n.a.			10 – 35 minutes
8	**Shore A hardness**	8.7	30 – 45	30 – 45	25 – 35	30 – 45
			After 24 hours at 23°C			After 72 hours at 23°C
9	**Peel adhesion**	8.8	≥ 95% cohesive failure, after 24 hours (2-component products) or 72 hours (1-component products) Samples to test must be stored in the same conditions as the bonded IG units are stored			
10	**Tensile strength and adhesion determined on H-specimen (12 mm x 12 mm x 50 mm)** Respective tensile force on H-specimen (12 x 12 x 50 mm)	8.9	≥ 0.7 MPa ≥ 95% cohesive failure 420 N	≥ 0.95 MPa ≥ 95% cohesive failure 570 N	≥ 0.7 MPa ≥ 95% cohesive failure 420 N	≥ 0.7 MPa ≥ 95% cohesive failure 420 N
11	**Book test**	8.10	≥ 95% cohesive failure, after 24 hours (2-component products) or 72 hours (1-component products) Samples to test must be stored in the same conditions as the bonded IG units are stored			
12	**Visual Inspection**	8.11	Before moving the IG units to the jobsite and when the adhesive has cured completely throughout. ▪ Complete joint filling according to drawings ▪ No air/gas inclusions / bubbles are allowed ▪ Joint dimensions correspond to drawings ▪ Accessories (supporting-spacer, U-profiles, etc.) must be installed according to drawings ▪ 95% adhesion on bonded substrates (95% cohesive failure of the joint) ▪ Homogenous joint curing, no soft spots, no white or deep black stripes			
13	**Deglazing** **Local adhesion tests on IG units** **Field adhesion test**	8.12				

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
na = not applicable
For different climate conditions as 23°C / 50% r.h. the values provided in this table may vary

9 REFERENCES

Pos.	Source	Title / Link
[I]	Bonding Excellence project plattform	http://www.sika-bonding-excellence.com
[II]	General Guideline	Design and calculation of Sikasil® SG joints in Structural Sealant Glazing applications
[III]	Additional Technical Information	Sikasil® IG opacification layer
[IV]	Additional Technical Information	Unipack opening
[V]	Additional Technical Information	Tensile test equipment for H-specimen of Sikasil® adhesives
[VI]	Additional Technical Information	Adhesion and compatibility test with Sikasil® IG, Sikasil® SG and Sikasil® WS adhesives and sealants for façade projects, following Sika`s Bonding Excellence Workflow
[VII]	Additional Technical Information	Mixer Open Time for 2-component Sikasil®
[VIII]	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
[IX]	Additional Technical Information	Remixing of B-component
[X]	Additional Technical Information	Processing of lower viscos Sikasil® A-component
	EN1279	Glass in Building - Insulating glass units Part 4: Methods of test for the physical attributes of edge seal components and inserts Part 6: Factory production control and periodic tests;
	ASTM C1249	Secondary Seal for Sealed Insulating Glass Units for Structural Sealant Glazing Applications
	EN 13022	Glass in building –Structural sealant glazing Part 1: Glass products for structural sealant glazing systems for supported and unsupported monolithic and multiple glazing Part 2: Assembly rules
	EAD 090010-00-0404	European Assessment Document for Bonded glazing kits and bonding sealants, version September 2018
	EOTA ETAG 002 part 1	Structural Sealant Glazing Systems Part 1: Supported and Unsupported Systems
	ASTM C1401	Standard Guide for Structural Sealant Glazing
	ASTM C1184	Standard Specification for Structural Silicone Sealants
	ISO 868	Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)