



GENERAL GUIDELINE

Window Bonding

Sikasil® WT Adhesives

JANUARY 2021 / VERSION 08 / SIKA SERVICES AG

Validity until January 2026, unless superseded

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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:

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

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).

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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:

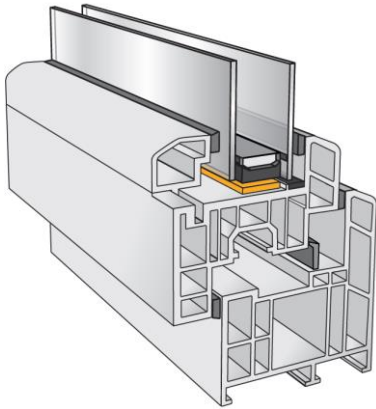


FIGURE 1 Rebate bonding

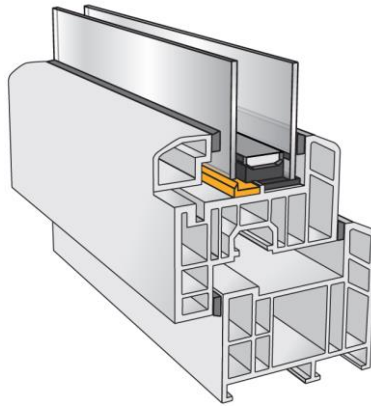


FIGURE 2 Glass edge bonding

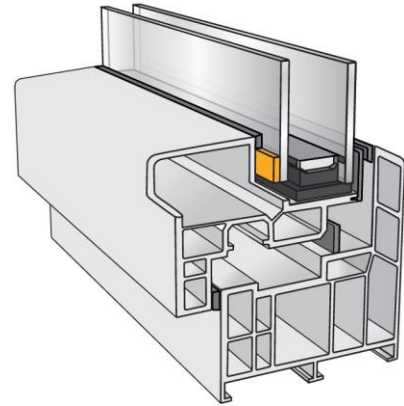


FIGURE 3 Overlap bonding

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

Ensuring a proper curing of a 1-component Sikasil® WT the maximum joint width / depth must be limited to 15 mm.

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 have to 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.

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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 1 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 1 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* Sika® Primer-209 N |
| 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* |

* Sika® Aktivator-100 and Sika® Aktivator-205 / Sika® Aktivator-205 LUM 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 or oily 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.

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5.2 APPLICATION OF Sika® Aktivator-100

Sika® Aktivator-100 is an activating agent 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.

Sika® Aktivator-100 is not a simple cleaning solvent but contains an adhesion promoter. It leaves active groups on the substrate surface.

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 in order to avoid wiping any residues back onto the surface. Immediately wipe-off the activator with a clean, dry, oil-free and lint-free paper before it dries.
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 Sika® Aktivator-100. 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. Sika® Aktivator-100 shall only be used within one month after opening the can. Discard any Sika® Aktivator-100 that has become opaque instead of transparent, has yellowed, gelled or separated.

5.3 APPLICATION OF Sika® Aktivator-205 AND Sika® Aktivator-205 LUM

Sika® Aktivator-205 and Sika® Aktivator-205 LUM are not simple cleaning solvents but contain an adhesion promoter to pre-treat surfaces to improve adhesion and shall always be applied on substrates after they have been properly cleaned.

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 in order to avoid wiping any residues back onto the surface. 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 Sika® Aktivator-205 / Sika® Aktivator-205 LUM. 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. Sika® Aktivator-205 / Sika® Aktivator-205 LUM shall only be used within one month after opening the can. Discard any Sika® Aktivator-205 / Sika® Aktivator-205 LUM 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.

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5.4 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):
 - $\geq 15\text{ °C}$: 10 minutes
 - $< 15\text{ °C}$: 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.

5.5 APPLICATION OF Sika® Primer-209 N

Sika® Primer-209 N shall always be applied after the surfaces have been properly cleaned and / or pre-treated with Sika® activators.

1. Shake Sika® Primer-209 N thoroughly - at least for 2 minutes. It is a coloured primer and the container contains a steel ball, which must be clearly heard while shaking. From this sound on keep shaking for at least 1 more minute.
2. Pour a small amount of Sika® Primer-209 N into a clean container.
Never dip any applicator into the original primer bottle.
3. Apply one thin but covering coat of Sika® Primer-209 N 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 30 minutes at 23 °C. Colder temperatures might require longer flash-off time.
5. The adhesives shall be applied within 2 hours after the application of Sika® Primer-209 N.

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

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

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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

The A-component and B-component of Sikasil® WT-470 / WT-480 / WT-485 have a paste-like consistency. To process the two components, a pump system with a follower plate is required.

1. After opening the 200 liter drum containing the A-component (base) remove the plastic cover sheet 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.

Neither the A-component nor the B-component require stirring because both components show very little tendency to separate. In the very unlikely case of an oil separation of more than 10 mm thickness on the B-component contact Sika's Technical Service before use.

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® WT-470 / WT-480 / WT-485 2-component silicone adhesives have to be thoroughly mixed by a 2-component silicone mixing and dispensing equipment with static or dynamic mixers.

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-470 / WT-480 / WT-485 catalyst and base is not required.

The mixer open time, that means the time the material can remain in the mixer without flushing or extrusion of the products, is significantly shorter than the snap time (pot life) indicated in the Product Data Sheets. If the alarm time is set too long, cured rubber particles become visible in the extruded material which can negatively influence the final product properties. To maintain a good mixing quality and long mixer lifetime, the alarm on the equipment has to be set to the values shown in Table 2.

Table 2 Mixer-open times and alarm times of 2-component Sikasil® WT adhesives at 23 °C

| Product | Mixer open time* | Alarm time equipment* |
|-----------------|--------------------|-----------------------|
| Sikasil® WT-470 | approx. 5 – 7 min | approx. 4 min |
| Sikasil® WT-480 | approx. 8 – 12 min | approx. 7 min |
| Sikasil® WT-485 | approx. 2 – 3 min | approx. 1 min |

* Above mentioned times significantly vary with ambient temperature and pump and mixer set-up and must be verified by tests under actual conditions. 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.

During shutdown, it is recommended that the dispensing and mixing equipment is purged with non-catalyzed base (A-component) in order 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).

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-470 / WT-480 / WT-485 is needed for that purpose if static mixers are used. The quality of mixing and the correctness of the mixing ratio must be checked (butterfly or marble test, mixing ratio by weight, see chapter 7, "Quality Assurance").

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6.1.2 WORKING WITH DUAL CARTRIDGES

If the material is processed out of the double-side cartridge, a pneumatic dispenser is required. In order 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 the application guideline "Sikasil® Manual Application - 2C dispenser for 490 ml cartridges".

6.1.3 APPLICATION

Sikasil® WT-470 / WT-480 / WT-485, 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.
- 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 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 and that the joint dimensions correspond to the calculated values.

Tooling and smoothing of joints have to 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.

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6.3 POWERCURE - BOOSTERED 1-COMPONENT WINDOW BONDING ADHESIVE

To ensure a fast curing, independent of air humidity, the 1-component adhesive is mixed homogeneously 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.

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7 QUALITY ASSURANCE

Perfect results require carrying out each processing step perfectly. Sika therefore recommends to install a strict 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.

Sika provides a lab case containing all tools required for the QC procedures described in this guideline.

Figure 6 shows the tools in the lab case. The figures are indicated in the guideline text behind in square brackets.

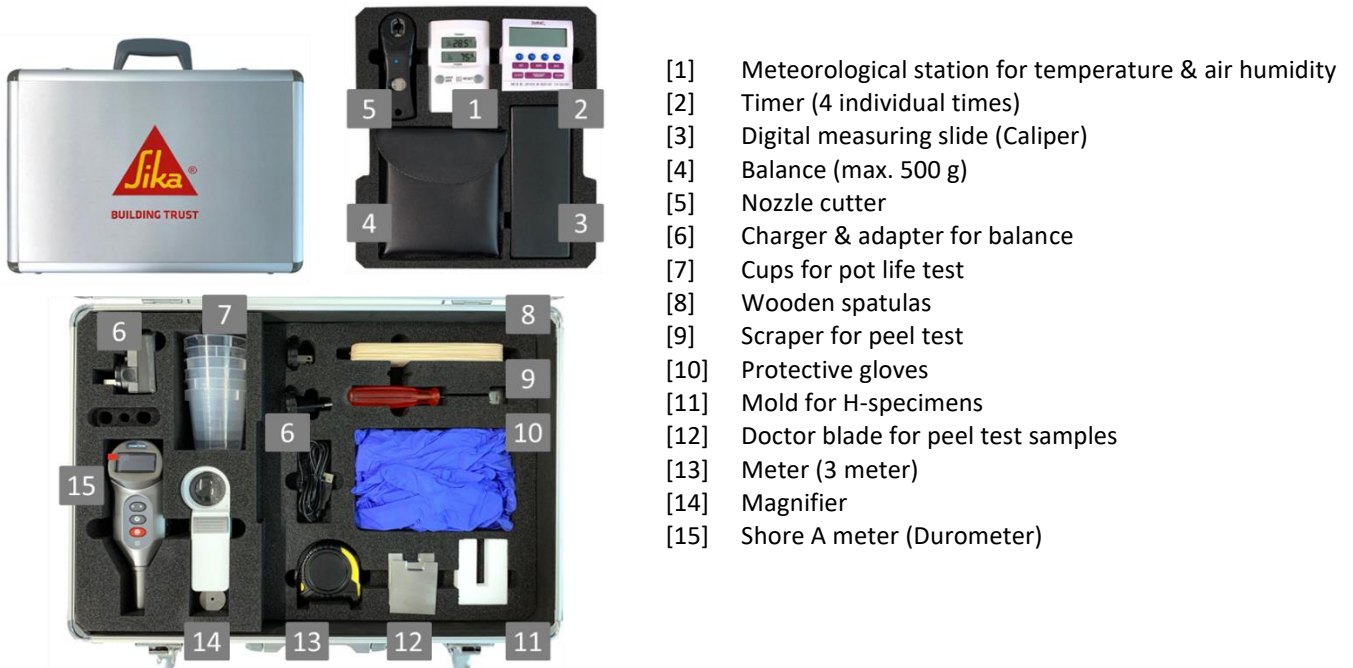


FIGURE 6 Lab case for quality control

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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 work. Adjust the mixture to the required ratio before continuing. In case of problems with setting the mixing ratio, contact the equipment manufacturer.

An alternative method for checking the mixing ratio is to compare the pot life (snap time) of the machine-mixed material with the pot life of a mixture weighed by hand in an exact ratio as stated in the corresponding Product Data Sheet.

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

The mixture must be homogeneous to ensure that Sikasil® WT-470 / WT-480 / WT-485 can achieve the ideal final properties. This can be tested by the marble test (glass plate test):

1. Apply a cone of mixed Sikasil® WT-470 / WT-480 / WT-485 to 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 pronounced 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

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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-470 / WT-480 / WT-485 along the fold, moving from one end 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).

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 fold



FIGURE 11 Unfold the foil - Positive test = ideal mixing



FIGURE 12 Unfold the foil - Negative test = inadequate mixing

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7.4 SNAKE TEST (2-COMPONENT PRODUCTS ONLY)

The snake test is used to check pump mixing quality and allows detecting inconsistent dispensing and cure, soft spots and inhomogeneous areas of mixed Sikasil® WT-470 / WT-480 / WT-485 as evidences that pump maintenance is required.

1. Apply a continuous “snake-shaped” bead at least 1 cm thick of Sikasil® WT-470 / WT-480 / WT-485 on a cardboard; allow the pump to extrude for approx. 3 – 5 minutes to apply an amount of adhesive equivalent to at least 5 times the volume of A-component pump (double stroke). Let the adhesive cure for at least 3 hours.
2. Finger-press the applied bead every 3 – 5 cm to check the status of curing of the mixed material.
If soft spots are identified, the adhesive is not properly dosed 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 a pump technician. If a static mixer is in use, it has to be cleaned or replaced.
3. Using a sharp knife cut the bead section every 5 – 10 cm and check the material conditions; the silicone must have a homogeneous color and must show uniform curing.
If you see white or deep-black stripes or distinct light-gray marbling, 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 technician. If a static mixer is in use, it has to be cleaned or replaced.

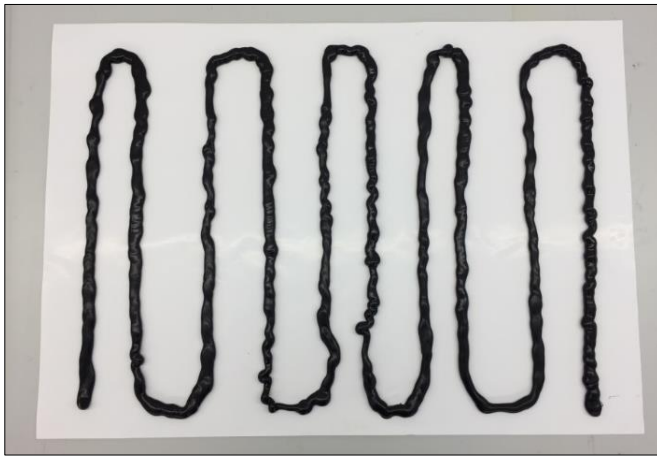


FIGURE 13 Snake-shaped bead

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

1. Extrude 30 – 75 ml freshly mixed silicone adhesive Sikasil® WT-470 / WT-480 / WT-485 (purge mixer sufficiently) from the machine into a small plastic cup, e.g. made of polyethylene [4].
2. Start the timer [3]. Then stir it briefly and vigorously with a wooden spatula [5].
3. After the respective time (30 minutes for Sikasil® WT-470 / Sikasil® WT-480 and 5 minutes for Sikasil® WT-485) 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 or snap time is the time from extrusion of the silicone adhesive until the point at which it no longer forms long strings (Figure 14) when the spatula is removed, but breaks off in short lengths (Figure 15).
6. The measured values have to be in line with the recommended values for quality control. Please be aware of the fact that the snap time strongly depends on the temperature of the material. Hand mixed material can have a longer snap time than mixtures from the static mixer.

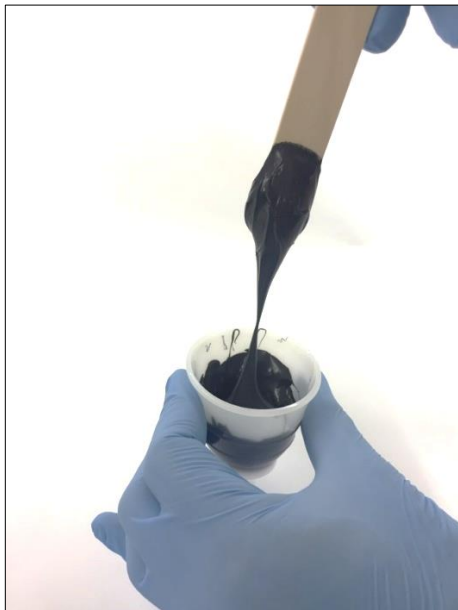


FIGURE 14 Material shows paste-like behavior:
→ snap time **not** yet reached



FIGURE 15 Material shows rubber-like behavior:
→ snap time reached

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7.6 SKIN TIME (1-COMPONENT PRODUCTS)

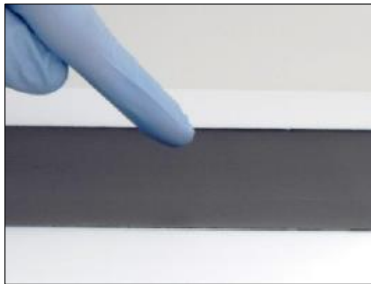
With 1-component products, check the skin time as follows:

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.

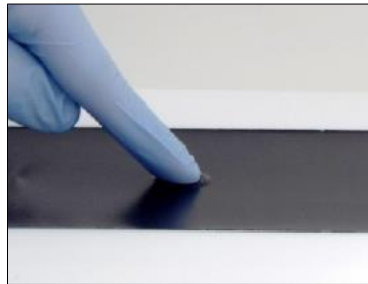
Skin time is the point at which the adhesive no longer sticks to the gloved finger (see Figure 16).

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

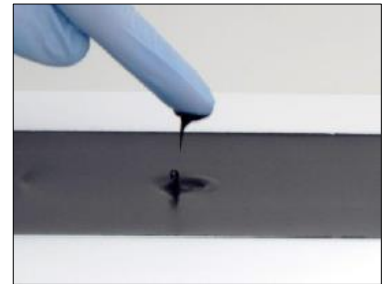
If there are drastic deviations from the values given in the Product Data Sheet or certificate of analysis, do not use this material for bonding and consult Sika Technical Department.



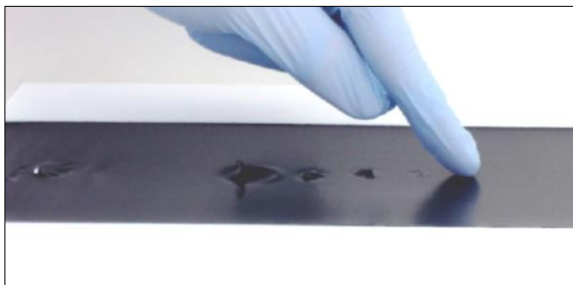
1.) Start at the beginning of the bead



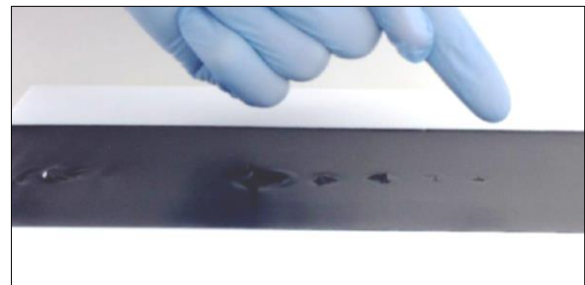
2.) Touch slightly the bead with the fingertip



3.) Remove and check for residues on the finger



4.) Always change the position for the next test



5.) If no residues on your fingertip are recognized the skin time has been reached

FIGURE 16 Testing steps for determination of the skin time

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7.7 SHORE A HARDNESS

Check the Shore A hardness according to ISO 7619-1 using a durometer [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 vulcanization. The minimum acceptable Shore A hardness of specific Sikasil® WT adhesives after 24 hours at room temperature (2-component adhesives and boosted adhesives) and 72 hours at room temperature (1-component adhesives) respectively is indicated in Table 4.

Table 4 Shore A hardness of Sikasil® WT adhesives after 24 hours (2-component and boosted adhesives) and 72 hours (1-component adhesive) respectively.

| Product | | Shore A Hardness |
|--------------------------|--------------------------------|------------------|
| Sikasil® WT-470 | | ≥ 25 |
| Sikasil® WT-480 | 2-component adhesives | ≥ 45 |
| Sikasil® WT-485 | | ≥ 35 |
| Sikasil® WT-40 | 1-component adhesives | ≥ 12 |
| Sikasil® WT-65 | | ≥ 15 |
| Sikasil® WT-66 PowerCure | Boostered adhesive (PowerCure) | ≥ 25 |

The above mentioned values were determined at 23 °C / 50 % r.h..

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 of at least 150 mm length onto a clean substrate of original material (pre-treatment exactly as in production line).
2. Draw a scraper e.g. a 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 and boosted adhesives) 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° 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 18) several times while still pulling.
7. Repeat this procedure until at least 50 % of the bead length has been tested.

Evaluation: the cured bead must not detach from the substrate (i.e. 90 % cohesive failure), tested after 24 hours (2-component and boosted adhesives) respectively 72 hours (1-component products).



FIGURE 17 Peel adhesion test: pulling the bead apart, 100 % cohesive failure occurring



FIGURE 18 Peel adhesion test on enameled glass: cutting the bead while pulling

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7.9 VISUAL INSPECTION

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

- 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.

1. Pull the adhesive tab out of the joint. Fold back the loose end of the adhesive at an acute angle of about 30° and try to detach the cured rubber from the surface (c.f. peel adhesion test). The adhesive must tear at least 90 % cohesively. It must not detach from either of the two surfaces and must not show any air bubbles. Inspect thru-cure of joint and mixing quality.
2. Check the joint dimensions. Notify the Technical Department of Sika Industry immediately if the joint dimensions do not match the definitions in the drawing.
3. Immediately after the test, activating of the surface is necessary. The window shall be re-bonded using the same adhesive as originally used.



FIGURE 19 Good adhesion, deglazing test positive



FIGURE 20 Adhesive failure, deglazing test negative

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8 REPAIR GLAZING

1. Cutting out the insulating glass unit: Use a sharp knife, vibration cutter or similar tools to separate the insulating glass unit from the sash profile. Cut the adhesive back in the way of leaving 1-2 mm silicone adhesive remaining on the substrate in order not damaging the surface of the frame. The cut must be absolutely smooth and must never leave loose adhesive parts on the cut surface.
2. Substrate preparation: The surfaces must be clean, dry, and free of dust, oil, grease and dirt. Bonding on trimmed adhesive surface is possible if the same material as the original one for the re-bonding is used.
3. 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.
4. Pre-treat the surface following chapter 5 accordingly.
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 in order 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 in order to minimize movement of glass units.

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

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.

10 RECOMMENDED BASIC QUALITY CONTROL SCHEME

This scheme shall be applied to the specific situation of the window producer.

Table 5 Example scheme for factory quality control

| Test | Chapter | Substrate | Frequency | Remark / Detailed Description | Requirements |
|---------------------------|-----------|-----------|--|---|--|
| 1 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 | Sikasil® WT-470 / WT-480 / WT-485 11.7:1 to 14.3:1 (A:B) by weight |
| 2 Marble / Butterfly Test | 7.2 & 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 | No white or deep black stripes, no marbling |
| 3 Snake Test | 7.4 | n/a | Regular and after any kind of adjustment of pump and mixing equipment | Only for 2-component products | No soft spots No white or deep black stripes, no marbling |
| 4 Pot life (Snap Time) | 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 | Sikasil® WT-470: 35 - 70 min. Sikasil® WT-480: 35 - 50 min. Sikasil® WT-485: 5 - 20 min. |
| 5 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. | Sikasil® WT-40: 10 - 40 min. Sikasil® WT-65: 15 - 40 min. Sikasil® WT-66 PowerCure: 20 - 60 min. |
| 6 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. | See chapter 7.7 |

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| | Test | Chapter | Substrate | Frequency | Remark / Detailed Description | Requirements |
|---|-------------------|----------------|--|---|--|--|
| 7 | 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) | >90 % cohesive failure, adhesive must be cured, no soft spots. |
| 8 | 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. | Joint dimensions correspond to drawings; no gas inclusions are allowed; accessories must be installed according to drawings |
| 9 | 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. | Joint dimensions correspond to drawings; no gas inclusions are allowed; accessories must be installed according to drawings |

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

Disclaimer

The information contained herein and any other advice are given in good faith based on Sika's current knowledge and experience of the products when properly stored, handled and applied under normal conditions in accordance with Sika's recommendations. The information only applies to the application(s) and product(s) expressly referred to herein. In case of changes in the parameters of the application, such as changes in substrates etc., or in case of a different application, consult Sika's Technical Service prior to using Sika products. The information contained herein does not relieve the user of the products from testing them for the intended application and purpose. All orders are accepted subject to our current terms of sale and delivery. Users must always refer to the most recent issue of the local Product Data Sheet for the product concerned, copies of which will be supplied on request.

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