Processing instructions

OTTOCOLL® S 645

1. Basics

The processing recommendations given in this document apply to applications in which the adhesive has to transfer static and dynamic loads. Since the bonding of glass facades is a technically very demanding application, the quality of the bond must be assured both by preliminary tests and by quality accompanying tests. This manual describes the procedure for carrying out quality-accompanying tests.

The following products have to be used:

OTTOCOLL® S 645	Two component silicone intended for structural bonding of glass and metals (approved according to ETAG002)
OTTOSEAL® S 7	One component silicone sealant for weather sealing of structural glazing units
OTTO Primer 1216	Primer to improve the adhesion to metals
OTTO Cleaner T	Cleaner for glass and metals

This processing instruction is a guideline for the user describing the correct storage, handling, application and quality assurance of OTTO Structural Glazing Silicone Adhesives. As a user of above mentioned products, you should read, understand and strictly follow the procedures and recommendations given. If any questions arise during use, please contact the Technical Service of Hermann Otto GmbH.

2. Planning and calculation of joint dimensions

The planning and calculation of the necessary adhesive joint dimensions must be carried out by a structural engineer according to valid guidelines. The following technical characteristics of the cured OTTOCOLL® S 645 can be used as a basis which have been determined by a testing institute according to the guideline for European technical approval for bonded glass structures „ETAG 002 Part 1: Supported and unsupported systems“:

Properties and characteristics	OTTOCOLL® S 645
Design stress in tension	0,20 MPa
Design stress in dynamic shear	0,17 MPa
Design stress in static shear	0,010 MPa
Elastic modulus in tension or compression E	2,74 MPa
Elastic modulus in shear tangential to G	0,91 MPa

Processing instructions

3. Ambient conditions during processing

We recommend a processing temperature between +5°C and +40°C as specified in the Technical Data Sheet. Furthermore we recommend storing the parts to be bonded and the adhesive itself in the production site at above mentioned temperature for at least 24 hours in order to avoid falling below the dew point. Additionally the environment should be as dust-free as possible. All surfaces and adhesive drums, pails and cartridges must not be exposed to direct sunlight, rain, snow or direct weathering.

4. Surface preparation

All surfaces must be free of grease, clean and dry. If case of any contamination during processing it must be removed before applying the adhesive.

Before applying a primer it is necessary to clean all surfaces.

In order to be able to control whether a surface has been primed it is possible to use OTTO Primer 1216 with UV marker (OTTO Primer 1216 SP 6315).

All surfaces, except those listed in the following table, must be qualified by preliminary tests before using the adhesive. Please contact the Technical Service (Krankenhausstraße 14, 83413 Fridolfing, Telefon 0049 8684 908-460).

Cleaning and Priming:

Surface	Pretreatment with
Glass according float glass EN 572-2 Manufacturer: Guardian Dudelange, L-3452 Dudelange as well as thermal pretensioned safety glass according to EN 12150, partly pretensioned safety glass according to EN 1863-1, laminated safety glass according to EN ISO 12543-1	OTTO Cleaner T
Anodised alumium according to EN 5005 H14(AlMg1) Manufacturer: not named	OTTO Primer 1216
Anodised alumium according to EN AW 6060, T66 Manufacturer: HD Wahl GmbH, D-89343 Jettingen-Scheppach	OTTO Primer 1216
Stainless steel 1.4301 grinded, grain size 320 Manufacturer: Fa. Marcegaglia, I-46040 Gazoldo Ippoliti, Mantova	OTTO Primer 1216

Processing instructions OTTO Cleaner T:

The surfaces have to be cleaned with the “wipe on/wipe off” method:

Apply OTTO Cleaner T on a clean paper towel (free of oil/grease and lint) and wipe the surface with it. The paper towel must be changed regularly.

Immediately afterwards OTTO Cleaner T has to be wiped off with a dry paper towel.
Repeat this process until the surface is clean, dry and free of grease.

Protect cleaned surfaces from dust and dirt. If the adhesive will not be applied within 2 hours the cleaning process must be repeated.

Processing instructions

Processing instructions OTTO Primer 1216:

The primer has to be applied with a clean cloth/application device (free from impregnating agents or fat/oil) or with a suitable paper towel (free from oil/grease and lint). A brush is generally not suitable for applying the primer. The primer layer must be as thin and homogeneous as possible. Too much primer has a negative effect on the adhesion.
The adhesive can be applied immediately after priming process. The time between primer application and further processing can be up to 2 hours if the pretreated surfaces are protected against contamination.

5. Processing of the adhesive

The above mentioned products must be used within the indicated shelf life. Adhesives used after the specified expiration date may not vulcanize correctly and may not achieve the desired physical properties. Therefore they must not be used any longer.

Preparatory activities:

Before the containers are fed into a mixing and metering system, samples of component A and B must be taken for quality control tests. The container of component B has to be closed after taking the sample. Component B (OTTOCURE S-CA 2375) is reactive to humidity. The container hast to be put into the mixing and metering equipment within 5 minutes after opening and the follower-plate must be placed on top.
If liquid of less than 1 cm has separated on the surface of the material in the container during a longer storage time, this must be removed. It can be done by using a paper towel. In case of a stronger separation of liquid (more than 1 cm), please consult the application technology department.

Processing:

For processing the adhesive out of the pails or/and drums suitable mixing and metering equipment (with drum follower plate pumps) must be used. For the selection of the metering and mixing technology, please contact the application technology department. Either static or dynamic mixers might be used. The suitability of the mixer must be ensured by means of preliminary tests. The mixing ratio given in the Technical Data Sheet must be observed.
The time until purging (pot life monitoring) must not exceed 5 minutes in order to avoid cured particles of the material in the mixer. The frequency and quantity of flushing must be determined in advance by practical tests. The mixing quality and the mixing ratio must be continuously checked by suitable quality tests (see item 6).
The mixed adhesive must be applied without entrapping air. The maximum depth of the adhesive joint is approx. 50 mm. In case of a deeper joint it can be filled partly. After curing for at least 12 hours another layer can be applied.
In order to remove excess of adhesive smoothing agents (soapy water, etc.) must not be used.

Compatibility of adjacent materials:

The following products have been tested regarding compatibility with OTTOCOLL® S 645:

Function	Product
Weather sealing	OTTOSEAL® S 7
Spacer tapes	VITO Glazingmount® 400 Norton Thermalbond® V2100
Insulated glass sealants	Please contact application technology department
PVB interlayers (laminated safety glass)	Please contact application technology department

Jointing with the weather sealing silicone must be carried out at the earliest 24 hours after SG bonding.

Transport and installation of structural glazing units:

Strucural glazing units must not be moved for the first 24 hours after bonding. After more than 24 hours the units may be placed vertically.

Vertical transport is allowed in case:

A. it is demonstrated by means of test specimens (see figure on page 8):
Requirement 1: tensile strength is minimum 0.7 N/mm²
Requirement 2: adhesive failure of maximum 5%

or

B. the bonded structural glass units have been stored for at least 4 days.

Final technical properties of OTTOCOLL® S 645 are reached after 7 days. Thereafter structural glass units may be installed.

6. Accompanying quality tests

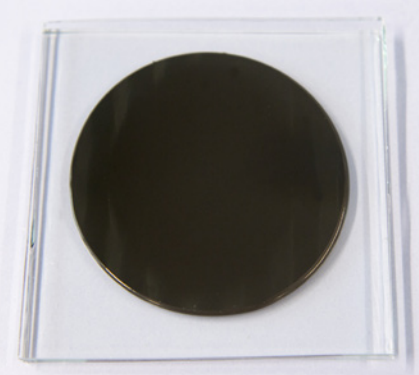
6.1 Checking the mixing ratio

The mixing ratio is 10 : 1 (A : B) by volume and 12.8 : 1 (A : B) by weight. The testing is usually done by weighing. Please refer to the user's manual of the mixing and dosing equipment.
The tolerance is ±10 %. That means mixing ratio might vary from 9 : 1 to 11 : 1 by volume or respectively 11.5 : 1 to 14.1 : 1 by weight.
An additional control of the mixing ratio should be carried out by measuring the pot life (see section 6.3). For this purpose, both components are taken from the bulk container (e.g. through a bypass line) and mixed manually with a ratio of 12.8 : 1 by weight.. The pot life of the manual test has to match with the pot life determined with mixed material from the mixing and metering unit.

6.2 Checking the mixing quality/homogeneity

A sample from the mixing and metering unit is pressed between two clean glass plates (glass plate test). The mixture should be homogeneous. In addition no hardened particles must be visible.

The test can also be carried out by means of a so-called butterfly test. For this purpose, a sheet of paper is folded lengthwise in the middle and opened again. A sample is then applied to the center and flattened by folding the paper together. After being pulled apart the mixture should be homogeneous and contain no light or dark streaks.



If the material shows light and/or dark streaks, the material is not well mixed. In this case, the following actions can be taken to solve the problem and improve the mixing quality:

- Prolonged „flushing“ of the static mixer with mixed material
- Replacing or cleaning the static mixer
- Contacting the manufacturer of the mixing and metering equipment

When processing by a mixing and metering unit (not with side-by-side cartridges), a finger-thick bead of adhesive is additionally applied to a cardboard (bead test). The quantity which has to be flushed should be three times the filling volume of the mixer. This adhesive bead should have frequent interruptions (start/stop).

After a curing time of 3 hours at room temperature, the curing of the adhesive bead is checked manually at all points by touching the bead (please use protective gloves). The adhesive bead must not have any areas that are sticky or still pasty.

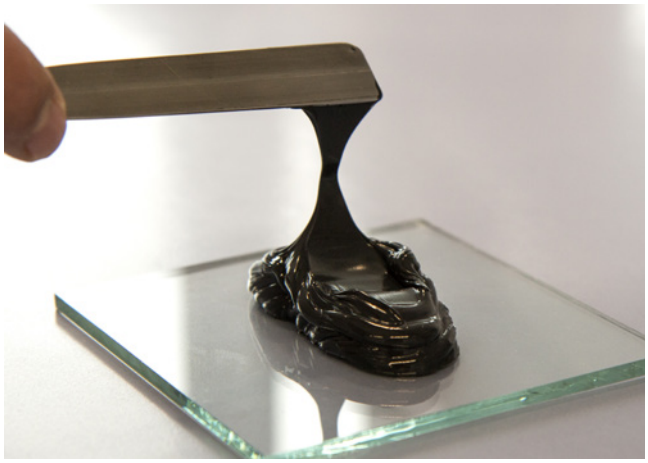
To judge the mixing quality from mixing and dispensing equipment, both tests must be carried out (butterfly and snake test).

6.3 Determination of pot life

The correct mixing ratio respectively curing rate are verified by determination of pot life.

For the determination of pot life put mixed 2-component silicone on a piece of PE film or glass and apply the paste by using a palette-knife. At the beginning the paste is soft but gets more ductile during the curing process. When the paste shows a resetting behaviour the end of pot life is reached. Ambient air temperature and air humidity are – amongst other things – factors, which can affect the pot life and thereby fluctuations of individual measurements can be generated.

Processing instructions



pasty consistency, spreadable
–> mixture has not reached its pot life yet

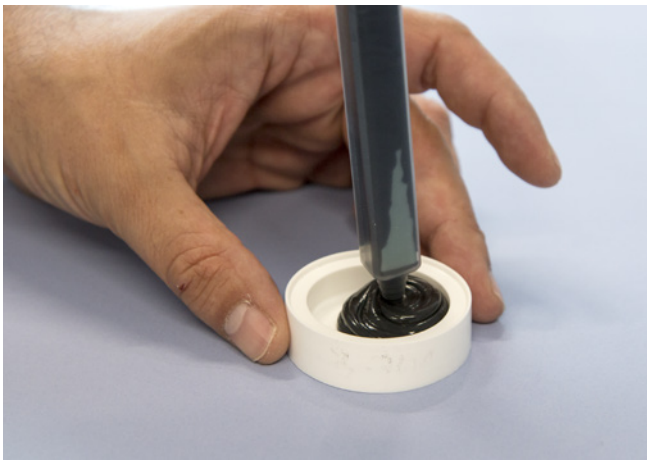
“chewing gum” consistency, the sealant shows resetting behaviour –> mixture has already reached its pot life

6.4 Determination of shore-A hardness according to DIN EN ISO 868

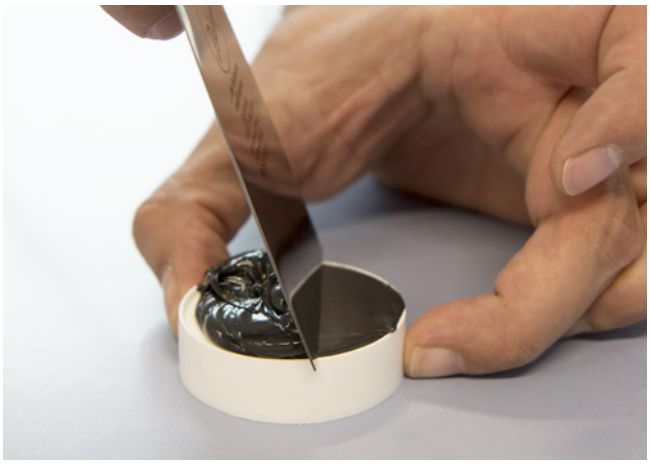
The proper constitution of a vulcanisate can be judged by rating the shore-A hardness.

A plastic ring or a plastic cap (e. g. of a bottle) with an inner diameter of at least 15 mm and a minimum depth of 6 mm will serve as additional aid. The adhesive will be filled void-free in the ring or the turned cap. The surface of the adhesive has to be drawn off smoothly by a palette-knife.

After curing of the adhesive the shore-A hardness can be tested by a special durometer (see specifications or technical data sheet).



Applying the adhesive



Drawing off the adhesive smoothly

Processing instructions

–> Determination of shore-A hardness by a durometer!

After a curing time of 24 hours at room temperature a Shore-A hardness of should be between 30° and 45°.

6.5 Adhesion test (Peel-Test)

Put an adhesive strip (dimensions 10 x 10 mm) of the mixed 2-component silicone on the treated substrates analog the specifications in the technical data sheet.
10 cm adhesive strip are sufficient. After a curing period of 24 hours cut the adhesive strip with a knife on one side and try to peel it off the substrate in a 90° angle

Application of adhesive

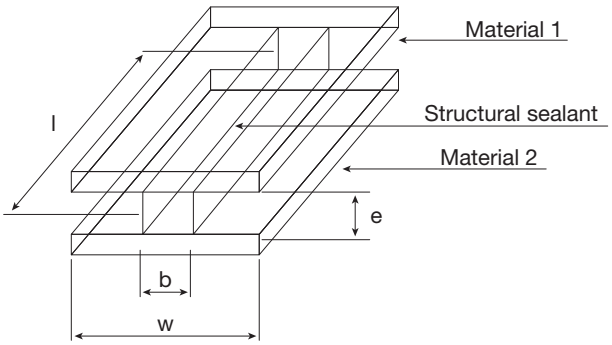
Cutting beetwen adhesive strip and glass plate

–> Peel off the adhesion strip and evaluate the appereance of fracture!
If there is a cohesion failure in the adhesive, the adhesion on the substrate is very good.

See also application video „Accompanying quality checks for processing 2c silicones“ on www.otto-chemie.de

6.6 Preparation of H-specimen (according to EOTA ETAG 002)

H-specimens have to be manufactured according to the specifications of EOTA ETAG 002. The materials used has to be taken from the serial production. They must be pretreated according to the procedure used in the production process



Symbol	Dimensions and tolerances (mm)
b	12 ± 1
e	12 ± 1
l	50 ± 2
w	40 ± 10

The test specimens has to be filled without entrapped air. Excessed adhesive is removed with a spatula. After a curing time of 3 days at room temperature (respectively before the bonded parts are intended to be transported), the test specimens are tested in a suitable tensile testing device at a test speed of 5 mm/minute.
The fracture pattern must show at least 95% cohesive failure and a minimum tensile strength of 0.7 N/mm².

Processing instructions

6.7 Deglazing

Deglazing is used to check the quality of the adhesive joint on the original facade element. The test must be performed on the fully cured element (after 4 days at the earliest). Shipping to the construction site is just allowed in case of a successful test.

For testing, the glass pane must be completely separated from the frame. The adhesive joint must be cut in the middle between frame and glass pane. After cutting the adhesive joint the glass pane should be lifted off. In order to check adhesion of adhesive using the peel test please ensure to have enough adhesive on both substrates.

Following parameter must be fulfilled:

a. Perfect adhesion of the adhesive to the frame and to the glass (peel test, 100 % cohesive fracture)
b. Homogeneous curing and mixing quality of the adhesive
c. Complete, free of entrapped air filling of the adhesive joint
d. Dimensioning of the adhesive joint (comparison with the specifications)

We recommend a photo documentation.

We recommend the following test plan

Number of unit 1 bis 10	1 unit
Number of unit 11 bis 40	1 unit
Number of unit 41 bis 100	1 unit
Following units 101	1 unit per 100

Units that show pre-damage and therefore cannot be installed in the facade can also be used for the test. In addition to the deglazing tests, we recommend visually inspecting of each unit.

Verarbeitungsanleitung

6.8 Overview essential quality checks

Topic	Test	Substrate	Frequency	Remarks/Test method/ When to test	Requirements
6.1	Mixing ratio per weight	irrelevant	after every change of drum/bucket every day before starting production	please use special tool if necessary	target A: B = 12.8:1 min 11.8:1 / max 13.8:1
6.2	Mixing quality	irrelevant	after every change of drum/bucket every day before starting production	if not o.k. please see 6.2	no light or dark streaks
6.3	Pot life	irrelevant	after every change of drum/bucket every day before starting production re-start after flushing	method please see 6.2	40 – 70 minutes
6.4	Shore-A hardness	irrelevant	after every change of drum/bucket every day before starting production	according to ISO 868	after 4 hours: ≥ 10 after 24 hours: 30 - 40
6.5	Adhesion (peel-test)	glass and frame	after every change of drum/bucket every day before starting production	after 24 hours	> 95 % cohesion failure
6.6	Tensile strength with H-specimen	glass and frame	after every change of drum/bucket every day before starting production	at least 2 specimen test after 3 days	> 0,7 MPa > 95 % cohesion failure
6.7	Deglazing	SG item	see table 6.7 test before shipping any SG item	check of bonding dimensions homogeneity adhesion entrapped air	conform to specification homogeneous curing and shape total cohesion failure no
6.7	Visual inspection	SG item	every item test before shipping any SG item	check of bonding dimensions homogeneity entrapped air damages	conform to specification homogeneous curing and shape no no

6.9 Content of logbook

The following table can be used as an example in order to record results of regular quality checks.

Project:

Date/Time	Temperature/ humidity	Batch # A and B	Mixing ratio per weight	Mixing quality	Pot life	Shore-A-Härte	Adhesion (glass / metal)	Tensile test	Deglazing	Inspector	Remarks

6.10 External audit of the production site and quality controls

In addition to the above described accompanying quality tests further tests by an external accredited institute are mandatory.
Tests which have to be done by the external testing institute are:

- verification of the documents of the accompanying quality tests
- verification whether the documented values correspond to the specification of the approval
- verification of the production conditions for the manufacturing of SG units
- verification of the function of the measuring instruments

Processing instructions

7. General Information

All information in this publication represents general guidelines only and is based on our current level of technical knowledge and our experience with proper storage and proper use of the product. The multitude of possible influences on processing and application does not release the processor from having to obtain certainty about the correct application of our products through their own tests and trials. If special requirements are made that are outside the areas of application and working conditions mentioned in the processing instructions, we are ready to provide support for further advice; this does not give rise to any legal obligations on our part of any kind. Due to the large number of applications and application conditions for our products, it is necessary in any case that all product properties important for the respective application are checked in advance by the user and verified in practice. For this purpose, the information in the current technical data sheet must be observed.

Since correct and professional processing of our products is not subject to manufacturer control, we can only ensure that the material is faultless.

Damage caused by planning and processing defects, incorrect material selection or insufficient surface cleaning are excluded from our warranty in any case. A legally binding assurance of certain properties or suitability for a specific purpose cannot be derived from this. The processor is responsible for observing any third-party property rights as well as existing legal regulations and provisions. Any verbal information provided by our employees that contradicts the content of these processing instructions has no effect without an express written confirmation from OTTO-Chemie. Applications that arise outside of the recommendations in these processing instructions are the responsibility of the processor without prior consultation with OTTO-Chemie. Any resulting damage is excluded from our warranty in such cases.