

Perfect assembling of timber glass-composite units



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Sealants • Adhesives



THE OTTO BUILDING WITH TIMBER-GLASS-COMPOSITE UNITS



Photo credits: North German Centre for Sustainable Construction, Verden

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Preface

Modern architecture is increasingly demanding building shells that visually bring the outside in and vice versa. This in turn means that the importance of glass is growing.

Another advantage of using glass in a building shell are the solar heat gains that can account for a large proportion of a house's energy usage. With the latest design passive houses, the solar energy input can make a conventional heating system unnecessary, bringing with it huge savings.

On the technical side, extremely high demands are made of the rigidifying effect large glass surfaces have on the building. Conventional structures to date always resulted in elaborate and expensive constructions or in solutions that detracted from the look. This unique solution can be employed to brace buildings by enabling the glass to take on a load-bearing function. This is made possible by a long-lasting load-carrying adhesive bonding with the wooden coupling frames. Take a look at the benefits of UNIGLAS® | **FACADE** in detail in the following.

The benefits of timber-glass composite units are:

- The system offers considerable advantages in terms of building physics and installation.
- The timber-glass-composite elements also provide heat insulation of U_{cw} up to $0.69 \text{ W/m}^2\text{K}$. This means that with the UNIGLAS® | **FACADE**, the latest requirements with regard to sustainable, environmentally-friendly construction are met, whether in a conservatory, extension or larger properties. UNIGLAS® | **FACADE** is therefore suitable for all construction projects.

The following description is an abbreviated summary by the HFA research project and Vienna University of Technology for the use of wood-glass composite elements.

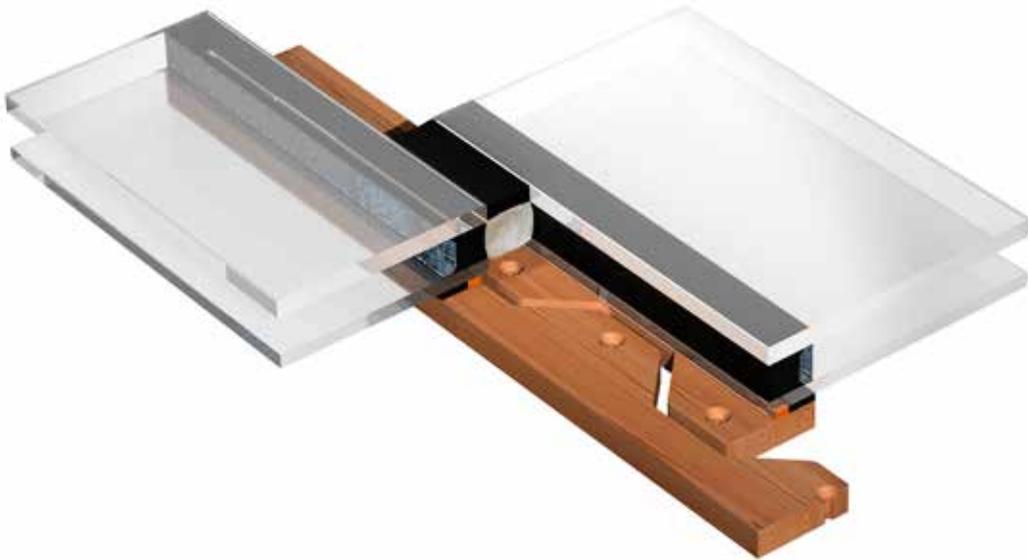
Which buildings are suitable for bracing?

In general, buildings should not exceed two storeys in height and 7 m eaves height. Detached, semi-detached and terraced houses suitable for conservatories and extensions therefore lend themselves to this.

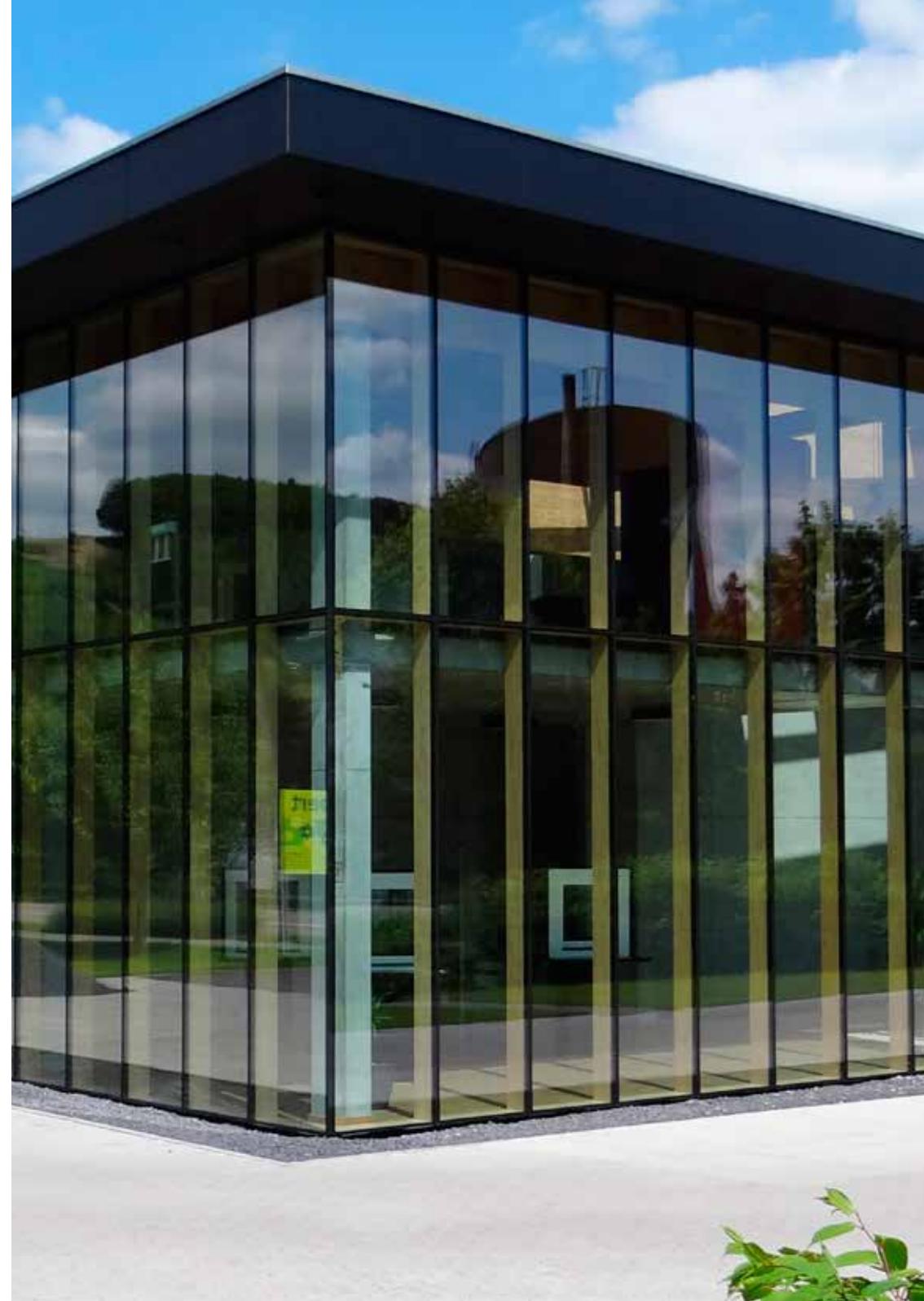
The precise requirements for the building are defined by the structural design of the entire building, the post-and-beam construction and the joining means. The supporting structure of the such as a post-and-beam structure, must be non-settling so as to avoid residual stress to the timber-glass composite units due to settlement.

What requirements are made of the timber-glass composite units?

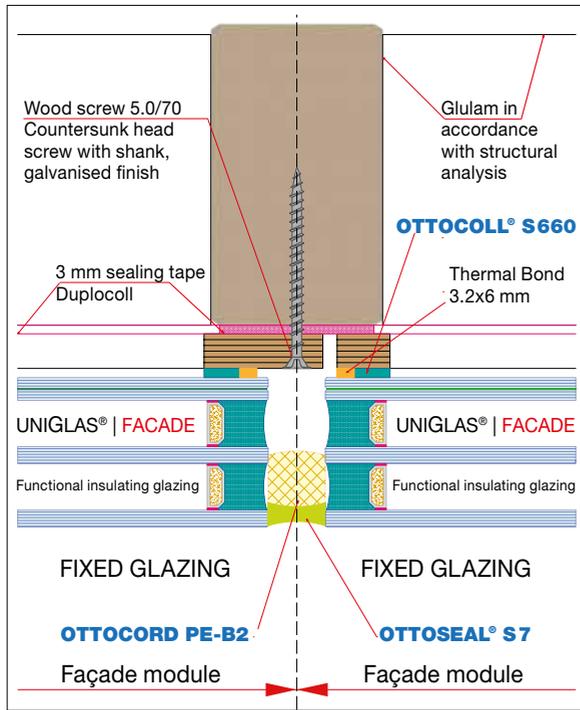
- Wood and glass take on a load-bearing role in the building shell. This means that unsatisfactory wind bracing used for rigidifying buildings can be formally dispensed with.
- The adhesive bond between wood and glass provides the requisite load-bearing structure.
- Timber-glass composite units adapt to a wide variety of structural requirements.



Design of a WGC element source: Uniglas



Façade system with wooden coupling frames (birch veneer plywood) in accordance with EN 636-2, bonding class 3 in accordance with EN 314-2



Design of timber-glass composite units

Source: Uniglas



Adhesive tape (Thermalbond V2100)



Applying the 2C silicone for wood-glass composite elements



What requirements are made of the materials?

The glass panes

- Minimum thickness of the inner glass pane
- 6mm with ESG or ESG-H made from Floatglas
 - 2 x 4mm FG as well as 0.76mm PVB film on LSG

Floatglas, TVG oder VSG

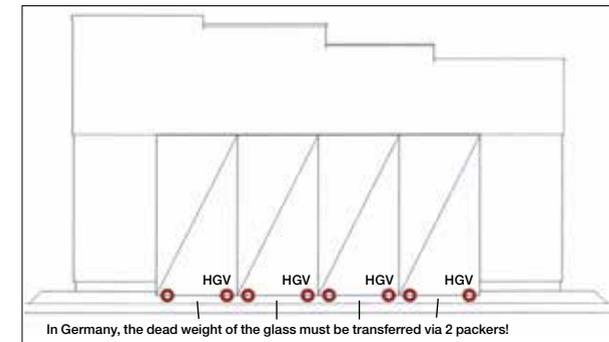
(je nach baurechtlicher Anforderung) als tragende Scheibe

Description	Dimensions vertically or horizontally, only with bracing function
Maximum length of the longer glass edge	3.5 m
Minimum length of the shorter glass edge	1.0 m
The length-to-height ratio of the glass pane	L / H = (1:1) to (2:1)

A bonded coupler is attached circumferentially around all four glass edges, which is evenly screwed to the supporting structure. The glass is made of 2- or 3-pane insulating glass with a supporting edge seal in accordance with EN 13022-1.

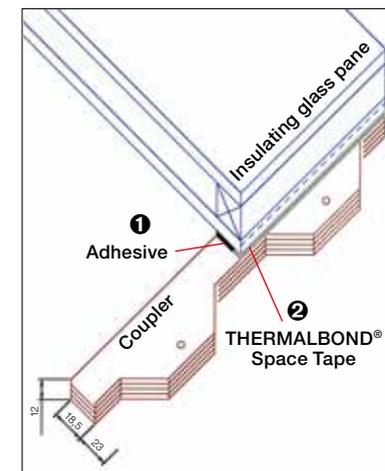
The dimensions of the glass pane under load (e.g. wind pressure or suction) must meet the applicable norms.

In accordance with construction regulations, measurements must only be taken by an authorised engineer. Load transfer is via packers or where permitted by legal regulations, adhesive.



Load transfer

Source: Holzforschung Austria



View of the coupler

Source: Holzforschung Austria

1 OTTOCOLL® S660



OTTOCOLL® S 660 – The 2C silicone special adhesive

Proof of the tests must be established in accordance with the “Basis for assessing bonded glazing systems” guideline. The requirements profile describes bonds at position 4 of the pane structure, bond variant V8.

The linear shear modulus must be determined longitudinally and transversely to the glue line, in addition to the tests required by the guideline.

The cyclic load tests must be determined at a reference level of $R_{u,5}/3$ in both shear directions in five tests each, taking into account ETAG 002, without any resulting reduction in tensile strength or rigidity.

Continuous load tests (creep formation after 91 days) must be carried out and evaluated under a continuous shear stress of ($R_{u,5}/15$) under 20 °C/65 % RF and at 55 °C.

The wooden coupler

In accordance with building approval no. Z-70.1-226, the coupling frame must be made from birch veneer plywood and have a minimum thickness of 12mm.

The interlocking geometry achieves a narrower visible width. For wider visible widths, the coupling frame can also be installed without interlocking.

It is necessary to coat the coupler (e.g. with thick wood varnish), however the adhesion point must remain uncoated.

Screws must be applied at least every 120 mm. Do not allow humidification of the coupler exceeding 17 % wood moisture content.

A 5 mm joint is purposely sealed using **OTTOCOLL® S 660** to achieve a rainproof corner. Coating the surfaces must be done after cutting.



Coupler surface coating

Construction timber for the façade (post-and-beam construction)

Minimum quality for type GL 24 H for laminated timber. In accordance with EN 14080 in conjunction with DIN 2000-3, all laminated timber types are made from beech or oak and approved according to AbZ (general building inspectorate approval) or ETA and laminated veneer timber approved according to EN 14374. A design example is included in the system structural analysis (see page 9). The minimum width of the post and beam in the façade construction is 60mm.

What requirements are made of the finish?

Planning

Using non-regulated construction components in Germany requires approval in individual cases (ZiE), a general type approval (abZ) or European Technical Approval (ETA). A general type approval (abZ) with comprehensive detailed catalogue and system structural analysis for the most common applications has been available since March 2016 for the UNIGLAS® | **FACADE** timber-glass-composite units. All relevant usability certifications are included in the type approval. The glass structure should be chosen according to building regulations and static requirements. If the dead weight of the glass pane is carried by the adhesive, this must be mathematically verified. In Germany, dead weight is not permitted to be carried by the glue line. This is why the load transfer should be borne by the substructure. Before manufacturing the timber-glass-composite elements, a construction drawing needs to be created in order to make sure that the neighbouring elements with their tooth system can actually be interlinked.

A parts list for the individual coupling frames can be drawn up from these drawings. Condensation should be taken into account.

In case of failure for constructions above 8m, additional mechanical safeguards are required in Germany.



Design of timber-glass composite units
Source: Uniglas

Requirements for the glue line

The width-to-thickness ratio of the glue line is $T / W = (1:2)$ to $(1:6)$. The minimum width of the glue line is 10 mm and the maximum width is 20 mm. The minimum thickness of the adhesive is 3 mm; length changes in the system related to temperature or moisture must be absorbed without causing damage.

The circumferential continuous bond must have the same adhesive dimensions at all four glass edges. The bond must be made free of cavities or bubbles. It must be done at the factory and may not be carried out on-site.



MSS visible mechanical safety device
(Petschenig)



Load transferring packer
(Petschenig)



OTTOCOLL® S660

The 2-component silicone for timber-glass-composite elements

Neutral, condensation curing 2-component silicone adhesive and sealant based on alkoxy

OTTO Compressed Air Gun P495 DP

Compressed air gun for the use of side-by-side cartridges 490 ml. Special pistol for increased product discharge

OTTOSEAL® S7

The weather sealing silicone

Neutral-curing 1-component silicone sealant

OTTOSEAL® S9

The 1-component insulating glass edge sealant

Neutral-curing 1-component silicone sealant and adhesive

Novasil® S42

The 2-component silicone for insulating glass edge sealing

Neutral, condensation-curing 2-component silicone adhesive and sealant based on alkoxy

OTTOCORD PE-B2

The closed-cell PE back-up foam rod

Extruded backfilling material made of polyethylene (PE)

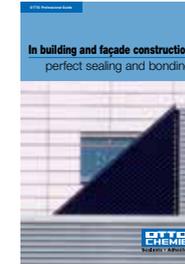




Part n° 9999533



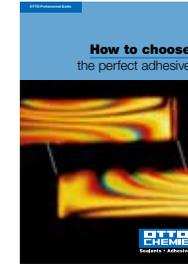
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Part n° 9999801



Part n° 9999568



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Part n° 9999711



Part n° 9999868



Part n° 9999551



Part n° 9999596



Part n° 9999875

OTTO Head office

Tel.: 0049-8684-908-540
Fax: 0049-8684-908-549
E-mail: info@otto-chemie.com
From UK: 0800-783 60 53

OTTO Technical Service

Tel.: 0049-8684-908-460
Fax: 0049-8684-908-469
E-mail: tae@otto-chemie.de

OTTO Order processing

Tel.: 0049-8684-908-310
Fax: 0049-8684-908-319
E-mail: mab@otto-chemie.de

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Notes:

The information in the present document corresponds to the status quo on going to print, refer to the index. With a new edition this edition becomes invalid. Due to the many possible influences during and after application, the customer always has to carry out trials first. Please observe the respective technical data sheet! This information is available on the Internet at www.otto-chemie.com. Errors and typographical errors are excepted.

For further information please contact:



Sealants • Adhesives

Hermann Otto GmbH · Krankenhausstr. 14 · 83413 Fridolfing, GERMANY
Tel.: 0049-8684-908-0 · Fax: 0049-8684-1260
E-mail: info@otto-chemie.de · Internet: www.otto-chemie.com