

## Allgemeine bauaufsichtliche Zulassung

Zulassungsstelle für Bauprodukte und Bauarten

Bautechnisches Prüfamt

Eine vom Bund und den Ländern  
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

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**Z-70.3-175**

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from: **11 January 2012**

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Applicant:

**seele sedak GmbH & Co. KG**

Einsteinring 1

86368 Gersthofen, Germany

Subject of approval:

**Glascobond® laminated safety glass with shear interaction**

The subject of approval named above is herewith granted an *allgemeine bauaufsichtliche Zulassung* ('national technical approval'). This *allgemeine bauaufsichtliche Zulassung* ('national technical approval') contains ten pages.

Translation authorized by DIBt

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## I GENERAL PROVISIONS

- 1 With the *allgemeine bauaufsichtliche Zulassung* ('national technical approval') the fitness for use and the applicability of the subject of approval in accordance with the *Landesbauordnungen* ('Building Codes of the *Länder*') have been verified.
- 2 If in the *allgemeine bauaufsichtliche Zulassung* ('national technical approval') requirements are made concerning the special expertise and experience of persons entrusted with the manufacture of construction products and types of construction in accordance with the relevant provisions of the Land following Section 17, Sub-section 5, of the *Musterbauordnung* ('Model Building Code'), it shall be noted that this expertise and experience can also be proven by equivalent verifications from other Member States of the European Union. If necessary, this also applies to verifications presented within the framework of the Agreement on the European Economic Area (EEA) or other bilateral agreements.
- 3 The *allgemeine bauaufsichtliche Zulassung* ('national technical approval') does not replace the permits, approvals and certificates prescribed by law for carrying out building projects.
- 4 The *allgemeine bauaufsichtliche Zulassung* ('national technical approval') is granted without prejudice to the rights of third parties, in particular private property rights.
- 5 Notwithstanding further provisions in the 'Special Provisions', manufacturers and distributors of the subject of approval shall make copies of the *allgemeine bauaufsichtliche Zulassung* ('national technical approval') available to the user and point out that the *allgemeine bauaufsichtliche Zulassung* ('national technical approval') shall be available at the place of use. Upon request copies of the *allgemeine bauaufsichtliche Zulassung* ('national technical approval') shall be placed at the disposal of the authorities involved.
- 6 The *allgemeine bauaufsichtliche Zulassung* ('national technical approval') shall be reproduced in full only. Partial publication requires the consent of Deutsches Institut für Bautechnik. Texts and drawings of advertising brochures shall not be in contradiction to the *allgemeine bauaufsichtliche Zulassung* ('national technical approval').
- 7 The *allgemeine bauaufsichtliche Zulassung* ('national technical approval') is granted until revoked. The provisions of the *allgemeine bauaufsichtliche Zulassung* ('national technical approval') can subsequently be supplemented and amended, in particular if this is required by new technical findings.

## II SPECIAL PROVISIONS

### 1 Subject of approval and field of application

#### 1.1 Subject of approval

The subject of approval is the product 'Glascobond® laminated safety glass with shear interaction' (Glascobond® -S) from the company seele sedak GmbH & Co. KG. It comprises at least two flat glass panes made from float glass, thermally toughened soda lime silicate safety glass (ESG), heat soaked thermally toughened soda lime silicate safety glass (ESG-H) or heat strengthened soda lime silicate glass (TVG) and the interlayer SentryGlas® SGP 5000.

If coated glass is to be used, the coating shall be on the side not facing the interlayer. Only in the case of enamelled glass with ESG, ESG-H or TVG shall the enamelled side be permitted to face the interlayer.

#### 1.2 Field of application

Glascobond® -S shall be permitted for use as laminated safety glass (VSG) in accordance with the *Technische Regeln für die Verwendung von linienförmig gelagerten Verglasungen (TRLV)* ('Technical rules for the use of linearly supported glazing')<sup>1</sup>, the *Technische Regeln für die Verwendung von absturzsichernden Verglasungen (TRAV)* ('Technical rules for the use of safety barrier glass')<sup>2</sup> and *Technische Regeln für die Bemessung und Ausführung punktförmig gelagerter Verglasungen (TRPV)* ('Technical rules for the design of point fixed glazing')<sup>3</sup>.

By way of derogation from TRLV<sup>1</sup>, TRAV<sup>2</sup> and TRPV<sup>3</sup>, the shear interaction between the individual panes in accordance with the conditions set out in Section 3 of this approval may be used for verification of the load bearing capacity capacity of vertically oriented Glascobond® -S glass under wind loads or horizontal line loads. The shear interaction between the individual panes in accordance with the conditions set out in Section 3 may also be used for verification of the load-bearing capacity of horizontally oriented Glascobond® -S glass for the snow load case.

With regard to the maximum allowable glass dimensions, the provisions set out in the technical rules shall apply in all cases with the exception of overhead glass in which case the dimensions shall not exceed 6000 mm x 3210 mm.

This *allgemeine bauaufsichtliche Zulassung* ('national technical approval') is based on analysis of German climate data and therefore only applies to the prevailing weather conditions in Germany.

### 2 Provisions for the construction product

#### 2.1 Characteristics and composition

##### 2.1.1 Glass panes

The following glass products shall be permitted for use:

– float glass (soda lime silicate glass) with CE marking in accordance with EN 572-9<sup>4</sup> and national conformity mark ('Ü mark') in accordance with the *Bauregelliste* ('Construction Products List')<sup>5</sup> A, Part 1, No. 11.10,

<sup>1</sup> *Technische Regeln für die Verwendung von linienförmig gelagerten Verglasungen (TRLV)*, version 08/2006, published in *Amtliche Mitteilungen* ('DIBt Official Bulletin'), issue 3/2007, 11 June 2007

<sup>2</sup> *Technische Regeln für die Verwendung von absturzsichernden Verglasungen (TRAV)*, published in *Amtliche Mitteilungen* ('DIBt Official Bulletin'), issue 2/2003

<sup>3</sup> *Technische Regeln für die Bemessung und Ausführung punktförmig gelagerter Verglasungen (TRPV)*, version 08/2006; published in *Amtliche Mitteilungen* ('DIBt Official Bulletin'), issue 3/2007, 11 June 2007

<sup>4</sup> DIN EN 572-9:2005-01 Glass in building - Basic soda lime silicate glass products - Part 9: Evaluation of conformity/Product standard

<sup>5</sup> *Bauregelliste* ('Construction Products List') A and B as well as List C published in *Amtliche Mitteilungen* ('DIBt Official Bulletin'), special issue no. 41, 27 June 2011

- ESG with CE marking in accordance with EN 12150-2<sup>6</sup> and national conformity mark ('Ü mark') in accordance with *Bauregelliste* (Construction Products List)<sup>5</sup> A, Part 1, No. 11.12,
- ESG-H with national conformity mark ('Ü mark') in accordance with *Bauregelliste* (Construction Products List) A, Part 1, No. 11.13,
- TVG in accordance with the provisions of an *allgemeine bauaufsichtliche Zulassung* ('national technical approval'),
- coated glass with CE marking in accordance with EN 1096-4<sup>7</sup> and national conformity mark ('Ü' mark) in accordance with *Bauregelliste* (Construction Products List)<sup>5</sup> A, Part 1, No. 11.11.

While the enamelled glass is laminated to form laminated safety glass, the enamelled glass surface may face the SentryGlas® SGP 5000 interlayer.

If coated glass panes are used, the coating shall face away from the interlayer. Only coatings with properties at least equivalent to black enamelled glass in terms of absorption performance and the resultant interlayer temperature shall be permitted for use.

### 2.1.2 SentryGlas® SGP 5000 interlayer

For the manufacture of 'Glascobond® laminated safety glass with shear interaction' a SentryGlas® SGP 5000 interlayer with a total nominal thickness of 0.89 mm to 3.04 mm shall be used. The product information provided by the manufacturer and information pertaining to the interlayer composition are deposited with Deutsches Institut für Bautechnik.

### 2.1.3 Glascobond® laminated safety glass with shear interaction

Glascobond® -S shall be manufactured from at least two flat glass panes as described in Section 2.1.1 and the SentryGlas® SGP 5000 interlayer as described in Section 2.1.2 in accordance with the provisions deposited with DIBt.

For the displacement between individual panes the dimensional limits specified in Section 3.2.3 of DIN EN ISO 12543-5<sup>8</sup> shall apply.

## 2.2 Manufacture, transport, storage and marking

### 2.2.1 Manufacture, transport and storage

The Glascobond® laminated safety glass with shear interaction shall be manufactured in an autoclave process from at least two glass panels as described in Section 2.1.1 and at least one SentryGlas® SGP 5000 interlayer as described in Section 2.1.2 in compliance with the provisions deposited with Deutsches Institut für Bautechnik.

The glass elements shall be transported only with appropriate material handling equipment that protects the glass edges from damage. For temporary storage at the construction site, appropriate padding shall be provided to protect the glass edges.

### 2.2.2 Marking

The Glascobond® laminated safety glass with shear interaction or the delivery note or the packaging shall be marked by the manufacturer with the conformity mark ('Ü mark') in accordance with the *Übereinstimmungszeichen-Verordnungen* ('Conformity Marking Ordinances') of the *Länder*. The mark shall only be applied if the requirements given in Section 2.3 are met.

The conformity mark ('Ü mark') shall include the short description 'Glascobond® laminated safety glass with shear interaction in accordance with Z-70.3-175'<sup>1</sup>.

- |   |                            |   |
|---|----------------------------|---|
| 6 | DIN EN 12150-2:2005-01     | Glass in building - Thermally toughened soda lime silicate glass<br>- Part 2: Evaluation of conformity/Product standard |
| 7 | DIN EN 1096-4:2005-01      | Glass in building - Coated glass - Part 4: Evaluation of conformity/Product standard                                    |
| • | DIN EN ISO 12543-5:1998-08 | Glass in building - Laminated glass and laminated safety glass<br>- Part 5: Dimensions and edge finishing               |

## 2.3 Certificate of conformity

### 2.3.1 General

In order to certify the conformity of the Glascobond® laminated safety glass with shear interaction with the provisions of this *allgemeine bauaufsichtliche Zulassung* ('national technical approval'), a certificate of conformity shall be issued for every manufacturing plant based on factory production control and regular external surveillance, including initial type-testing of the construction product, in accordance with the following provisions.

To issue the certificate of conformity and for external surveillance, including the associated product testing, the manufacturer of the construction product shall use a certification body and an inspection body recognised for these purposes. By affixing the national conformity mark ('Ü mark'), indicating the intended use, the manufacturer declares that the certificate of conformity has been granted.

The certification body shall send a copy of the certificate of conformity issued by the same to Deutsches Institut für Bautechnik. A copy of the initial type-testing report shall also be sent to Deutsches Institut für Bautechnik.

### 2.3.2 Factory production control

A factory production control system shall be set up and implemented at each manufacturing plant in which the SentryGlas® SGP 5000 interlayer and/or the Glascobond® laminated safety glass with shear interaction are manufactured. Factory production control is understood to be continuous surveillance of production by the manufacturer to ensure that the manufactured construction products satisfy the requirements set out in this *allgemeine bauaufsichtliche Zulassung* ('national technical approval').

The results of factory production control shall be recorded and evaluated. The records shall at least include the following information:

- designation of the construction product or the starting material or the components,
- type of inspection or test,
- date of manufacture and testing of the construction product or the starting material or the components,
- results of the inspections and tests as well as (if applicable) comparison with requirements,
- address of the installation location (if unknown, purchaser of the glass),
- signature of the person responsible for factory production control.

The factory production control shall at least include the following measures:

a) manufacturer of the SentryGlas® SGP 5000 interlayer as described in Section 2.1.2

- description and verification of the starting material,
- verification of the chemical composition,
- verification of compliance with the requirements described in Section 2.1.2,
- documentation of relevant production parameters used in the manufacture of the SentryGlas® SGP 5000 interlayer. The production parameters shall correspond to the specifications deposited with Deutsches Institut für Bautechnik.
- moisture content measurements performed on the sheet, once a day, max. moisture content: 0.15%
- pummel test performed on the laminate: once a day (2.1-mm-thick float glass)
- thickness check every 12 hours

Compliance with the above requirements shall be verified by the manufacturer of the interlayer by issuing of declaration of compliance with the order (type 2.1) in accordance with DIN EN 10204<sup>9</sup>.

b) Manufacturer of Glascobond® laminated safety glass with shear interaction as described in Section 2.1.3

- description and verification of starting material (e.g. interlayer thickness) and comparison with requirements
- documentation of storage conditions for SentryGlas® SGP 5000 with packaging opened
- check of the declaration of compliance with the order (type 2.1) in accordance with DIN EN 10204<sup>9</sup> for the SentryGlas® SGP 5000 interlayer and comparison with requirements
- check of CE and Ü marks on the glass used in accordance with Section 2.1.1
- verification of compliance with requirements described in Section 2.1.3
- documentation of relevant production parameters used in the manufacturing process as described in Section 2.2.1 (e.g., temperature and pressure control in the autoclave); production parameters shall correspond to the specifications deposited with Deutsches Institut für Bautechnik
- regular visual inspection of Glascobond® -S as per DIN EN ISO 12543-6<sup>10</sup>
- high-temperature test in accordance with Section 4.1 of DIN EN ISO 12543-2<sup>11</sup> on specimens composed of 3 mm float glass / 1.52 mm SentryGlas® SGP 5000 / 3 mm float glass at least once a month.
- ball drop test as per DIN 52338<sup>12</sup> from a height of 4 m on at least five test specimens composed of 3 mm float glass / 0.89 mm SentryGlas® SGP 5000 / 3 mm float glass at least once a month.
- pummel test in accordance with the work instructions deposited with Deutsches Institut für Bautechnik.
- manufacture of samples which will be retained for testing within the framework of external surveillance (retained samples).

The records shall be kept for at least ten years and submitted to the inspection body used for external surveillance. They shall be presented to Deutsches Institut für Bautechnik and the competent supreme building authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to resolve the defect. Construction products which do not meet the requirements shall be handled in such a manner that they cannot be confused with compliant products. After the defect has been remedied, the relevant test shall be repeated immediately, where technically feasible and necessary to show that the defect has been eliminated.

**2.3.3 Initial type-testing of Glascobond® laminated safety glass with shear interaction**

The following checks and tests shall be performed within the framework of initial type-testing of Glascobond® -S:

- visual inspection of Glascobond® -S in accordance with DIN EN ISO 12543-6<sup>10</sup>
- high-temperature test in accordance with Section 4.1 of DIN EN ISO 12543-2<sup>11</sup> on specimens composed of 3 mm float glass / 1.52 mm SentryGlas® SGP 5000 / 3 mm float glass

<sup>9</sup>	DIN EN 10204:2005-01	Metallic products - Types of inspection documents
<sup>10</sup>	DIN EN ISO 12543-6:1998-08	Glass in building - Laminated glass and laminated safety glass - Part 6: Appearance
<sup>11</sup>	DIN EN ISO 12543-2:2006-03	Glass in building - Laminated glass and laminated safety glass - Part 2: Laminated safety glass
<sup>12</sup>	DIN 52338:1985-09	Test methods for flat glass for use in building - Ball drop test on laminated glass

- ball drop test as per DIN 52338<sup>12</sup> from a height of 4 m on at least five test specimens composed of 3 mm float glass / 0.89 mm SentryGlas® SGP 5000 / 3 mm float glass
- pummel test in accordance with the work instructions deposited with Deutsches Institut für Bautechnik
- tensile test on small specimens in accordance with the specifications deposited with Deutsches Institut für Bautechnik; the results shall lie within the range of values deposited with Deutsches Institut für Bautechnik.

#### 2.3.4 External surveillance

The factory production control system used at the manufacturing plant for the Glascobond® laminated safety glass with shear interaction shall be checked regularly at least twice a year by means of external surveillance. Within the scope of the external surveillance audit initial type-testing of Glascobond® -S shall be carried out as described in Section 2.3.3. Besides checks for compliance with the requirements described in Section 2.1.3, the following checks shall be made:

- check of the results of factory production control as described in Section 2.3.2
- pummel test in accordance with the work instruction deposited with Deutsches Institut für Bautechnik
- tensile test on small specimens in accordance with the specifications deposited with Deutsches Institut für Bautechnik; the results shall lie within the range of values deposited with Deutsches Institut für Bautechnik and serve to determine the allowable range of values for the specimens used in factory production control. Upon request, a copy of the test report shall be presented to Deutsches Institut für Bautechnik.

Within the framework of external surveillance, pummel tests and tensile tests shall be carried out on retained specimens to verify shear interaction durability. Information on sampling frequency and storage conditions for the retained samples is deposited with Deutsches Institut für Bautechnik. The results shall comply with the minimum values upon which the approval process is based and which have been confirmed in the initial type-testing process. Upon request, a copy of the test report shall be presented to Deutsches Institut für Bautechnik.

The certification and external surveillance results shall be kept for at least ten years. The certification body or inspection body shall present them to Deutsches Institut für Bautechnik and the competent supreme building authority upon request.

### 3 Provisions for design and dimensioning

#### 3.1 Single-pane glazing

Linearly supported Glascobond® -S shall be dimensioned in accordance with the provisions of the 'Technical rules for the use of linearly supported glazing (TRLV)'<sup>1</sup>. For overhead use Glascobond® -S shall be supported linearly on all sides with a support width of more than 1.20 m.

For point fixed glazing, the 'Technical rules for design of point fixed glazing (TRPV)'<sup>3</sup> shall be observed.

If the Glascobond® -S glass is used for retaining glass barriers, the 'Technical rules for the use of safety barrier glass (TRAV)'<sup>2</sup> shall be observed. The less stringent verification requirements given there for laminated safety glass with PVB film, such as 'Glass with verified impact resistance' as described in Section 6.3, shall also apply to the Glascobond® -S glass described in this *allgemeine bauaufsichtliche Zulassung* ('national technical approval').

For verification of the load-bearing capacity under wind loads and horizontal line loads in accordance with the provisions of TRLV<sup>1</sup> and TRAV<sup>2</sup>, a linear elastic behaviour of the SentryGlas<sup>®</sup> SGP 5000 interlayer may be assumed to factor in the shear interaction between the individual panes of vertical glass by derogation from the provisions of TRLV<sup>1</sup> and TRAV<sup>2</sup> provided that the conditions listed below are met. A shear interaction between individual panes may also be considered for verification within the scope of TRPV<sup>3</sup>.

Depending on the load type, the shear modulus values given in Table 1 and a Poisson's ratio of  $\mu = 0.49$  may be used as linear elastic characteristics of the SentryGlas<sup>®</sup> SGP 5000 interlayer for single-pane glass. The allowable stresses for float glass-based Glascobond<sup>®</sup> laminated safety glass with shear interaction are given in Table 1. The characteristics for verification of the 'horizontal line loads' in the interior area apply to a film temperature of up to 30 °C and a maximum load duration of one hour.

Table 1: Characteristics applicable to single-pane glass

Load case		Shear modulus G [N/mm <sup>2</sup> ]	$\sigma_{\text{allowable, Glascobond®-S}}$ from float glass [N/mm <sup>2</sup> ]
Facades	<b>Glass without fall protection function</b>		
	Load case: wind	100	18
	<b>Glass with fall protection function</b>		
	Load case: horizontal line load <sup>13</sup>	4	18
	Load case: wind and horizontal line loads	65	18
Interiors	<b>Glass without fall protection function</b>		
	Load case: wind	100	18
	<b>Glass with fall protection function</b>		
	Load case: horizontal line loads	65	18
	Load case: wind and horizontal line loads	65	18
Overhead use	Load case: snow	60	12
	Load case: dead load	0	12

For Glascobond<sup>®</sup> laminated safety glass with shear interaction made from ESG, ESG-H, TVG and enamelled ESG or enamelled TVG as described in Section 2.1.1 the allowable stresses specified in TRLV<sup>1</sup> and the corresponding *allgemeine bauaufsichtliche Zulassung* ('national technical approval') for HSG shall apply.

<sup>13</sup>

Applicable for a maximum temperature of 50 °C, a load duration of one hour and under the following additional conditions for use of Glascobond<sup>®</sup> laminated safety glass with shear interaction:

- either as single pane or room-facing pane in insulating glass units made from two panes of clear glass or glass with a low iron oxide content, with or without a neutral thermal insulation coating
- or as exterior pane in insulating glass units made from uncoated or unprinted Glascobond<sup>®</sup> -S.



By derogation from these specifications, for verification of the load case 'horizontal line loads' for facades, a temperature calculation shall be allowed for the determination of the film temperature in accordance with the specifications given in DIN EN 13363-2<sup>14</sup> for the respective glass configuration and the expected use conditions (location, orientation, inclination). In the absence of available data, the following conditions may be assumed for steady-state calculations for vertical installation:

Outside: temperature 30 °C, heat transfer coefficient 12 W/m<sup>2</sup>K, solar radiation exposure 850 W/m<sup>2</sup>;

Inside: temperature 26 °C, heat transfer coefficient 8 W/m<sup>2</sup>K.

The shear modulus values for load duration of one hour shall be taken from Table 2 for the respective interlayer temperatures. Linear interpolation shall be allowed for calculated values between the given values.

Table 2: Values of shear modulus for different interlayer temperatures

Interlayer temperature T [°C]	30	35	40	45	50	55	60
Shear modulus G [N/mm <sup>2</sup> ]	65	30	9	7	4	3	2

Interlayer temperatures higher than those given in Table 2 are not considered in this *allgemeine bauaufsichtliche Zulassung* ('national technical approval').

### 3.2 Insulating glass

For the determination of stresses arising from climatic conditions (temperature, atmospheric pressure, altitude) for verification of insulating glass with Glascobond® -S, the procedure specified in Section 5.1.2 of TRLV<sup>1</sup> shall be used. For the determination of stresses arising from wind and horizontal line loads the characteristics given in Section 3.1 shall apply. The stresses arising from climatic conditions and the stresses from wind and horizontal line loads determined using the values given in Section 3.1 shall be completely superimposed.

## 4 Provisions for execution

For the installation of linearly supported Glascobond® laminated safety glass with shear interaction, the provisions of TRLV<sup>1</sup> shall apply. If Glascobond® -S is used as a barrier against falling, the provisions of TRAV<sup>2</sup> shall apply. For the installation of point fixed Glascobond® -S, the provisions of TRPV<sup>3</sup> shall be observed.

It shall be ensured that the glass or interlayer edges are only in contact with adjacent materials which are long-term compatible with the SentryGlas® SGP 5000 interlayer used. The relevant instructions provided by seele sedak GmbH shall be observed.

<sup>14</sup> DIN EN 13363-2

Solar protection devices combined with glazing - Calculation of total solar energy transmittance and light transmittance - Part 2: Detailed calculation method

**5 Fire protection**

The Glascobond® laminated safety glass with shear interaction meets the reaction-to- fire performance requirements for construction products corresponding to class E in accordance with DIN EN 13501-1<sup>15</sup>. (Class E meets the national regulatory requirement *normalentflammbar* (‘normally flammable’).)

**6 Provisions for use and maintenance**

Damaged panes shall be replaced immediately. Hazardous areas shall be sealed off immediately. When replacing the panes, it shall be ensured that solely construction products in accordance with this *allgemeine bauaufsichtliche Zulassung* (‘national technical approval’) are used.

Andreas Schult  
Head of Section

*Beglaubigt*

<sup>15</sup>

DIN EN 13501-1:2007-05

Fire classification of construction products and building elements