

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-18/0578
of 31 July 2019

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Trigon SG Insert Elements

Product family
to which the construction product belongs

Structural Sealant Glazing System

Manufacturer

HUECK System GmbH & Co. KG
Loher Straße 9
58511 Lüdenscheid
DEUTSCHLAND

Manufacturing plant

HUECK System GmbH & Co. KG
Loher Straße 9
58511 Lüdenscheid
DEUTSCHLAND

This European Technical Assessment
contains

19 pages including 10 annexes which form an integral
part of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

ETAG 002 Part 1: "Supported and unsupported systems",
ETAG 002,
used as EAD according to Article 66 Paragraph 3 of
Regulation (EU) No 305/2011.

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Specific part

1 Technical description of the product

The subjects of this European Technical Assessment (ETA) are Trigon SG Insert Elements. These insert elements are insulating glass opening units consisting of two or three glass panes. They are manufactured as stepped insulating glass. Parallel opening windows and top hung windows are covered by Trigon SG Insert Elements.

The outer pane is factory-bonded in a load-bearing manner to the outer shell of the casement which is connected via thermal barriers to the inner shell of the casement. Glass supports are used to bear the weight of the panes. For the case of bond failure mechanical retaining devices are provided. The depth of the thermal barriers varies depending on the respective glass composition. No permanent load may stress the thermal barriers. Therefore metal corner connector profiles are pushed into the corners of the perimeter casements.

The allowable size of Trigon SG Insert Elements depends on the location-specific actions to be taken into consideration, that means the results of the required structural analysis.

The system design is illustrated in the Annexes 1 and 2 for two-pane and three-pane elements.

2 Specification of the intended use in accordance with the applicable European Assessment Document ETAG 002-1

The performances given in Section 3 are only valid if the Trigon SG Insert Elements are used in compliance with the specifications and conditions given in the Annexes A to C.

Trigon SG Insert Elements are installed in the façade.

The use of Trigon SG Insert Elements for the stiffening of other building elements is not covered by this ETA.

For the use in structures the following types are differentiated in accordance with ETAG 002-1¹:

Type I: Mechanical transfer of the self-weight of the facade element to the sealant-support frame and thence to the structure. The structural sealant transfers all other actions. Devices are used to reduce danger in the event of bond failure.

Type II: Mechanical transfer of the self-weight of the facade element to the sealant-support frames and thence to the structure. The structural sealant transfers all other actions and no devices are used to reduce danger in the event of bond failure.

¹ ETAG-002-1: Guideline for European Technical Approval for Structural Sealant Glazing Systems (SSGS), Part 1: Supported and Unsupported Systems

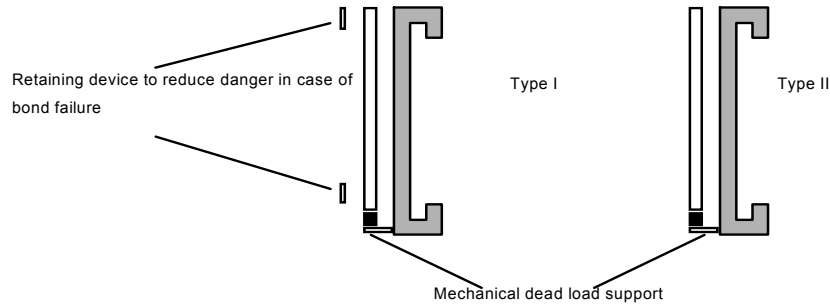


Figure 1: Schematic examples of types I and II

The verifications and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of Trigon SG Insert Elements of at least 25 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Characteristics of the different glass products (characteristic bending strength, coating)	See Annex A
Use scenario for the heat soaking process	Use scenario 1a/1b; see Annex A
Use scenario for the compound effect of laminated safety glass	Use scenario 2a/2b; see Annex A
Structural bonding: Substrates and adhesive; load-bearing capacity	See Annex B
Mechanically fixed glazing support, mechanical safety devices (emergency retainers) and thermal barriers: - Load-bearing capacities	See Annex C

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire of single glass panes and metal components in accordance with the provisions of EC Decision 1996/582/EC	A 1

English translation prepared by DIBt

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with ETAG 002 used as EAD the applicable European legal act is: 1996/582/EC².

The systems to be applied are:

- System 1 for Type II
- System 2+ for Type I

In addition the European legal act is: 2003/656/EC³ is valid for the reaction to fire of products according to this European Assessment Document.

The systems to be applied are:

- System 1, 3, 4

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable European Assessment Document

Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 31 July 2019 by Deutsches Institut für Bautechnik

BD Dipl.-Ing. Andreas Kummerow
Head of Department

beglaubigt:
Herr

² Official Journal of the European Communities no L 254/62 of 08.10.1996
³ Official Journal of the European Communities no L 231/15 of 17.09.2003

Annex A

Characteristics of the different glass products

Trigon SG Insert Elements are made of double or triple insulating glass. Depending on the use scenario given below and the requirements due to the designing results for the existing actions at the place of installation the suitable glass products are chosen.

The basic glass type of all glass products is float glass according to EN 572-9⁴ made of soda lime silicate glass. Dependent on the appropriate use scenario the following products are suitable: thermally toughened soda lime silicate safety glass according to EN 12150-2⁵, coated glass according to EN 1096-4⁶, heat soaked thermally toughened soda lime silicate safety glass according to EN 14179-2⁷, heat soaked thermally toughened soda lime silicate safety glass according to EN 14179-2 but with deviating requirements concerning the duration of the holding phase of four hours and the involvement of a third party for controlling the heat-soaking process, heat strengthened soda lime silicate glass according to EN 1863-2⁸ and laminated safety glass according to EN 14449⁹ with an interlayer made of polyvinyl butyral (PVB). The PVB-interlayer has to feature the following properties for tear strength > 20 N/mm² and for elongation at rupture > 250 %.

Glazing used for the outer pane of the insulating glass unit is to be produced of heat soaked thermally toughened soda lime silicate safety glass according to EN 14179-2 or heat soaked thermally toughened soda lime silicate safety glass according to EN 14179-2 but with deviating requirements concerning the duration of the holding phase of four hours and involving a notified body for controlling the heat-soaking process with respect to the appropriate use scenario.

The characteristic bending strength of the glass panes according to EN 1288-3¹⁰ is given in the "Declaration of Performance" as basis for the designing respectively to ensure that they will safely transmit the wind load to the support frame via the structural sealant.

The glass panes coated or entirely or partially enamelled may only be used for bonding, if the adhesive behaviour of the surfaces has been verified according to ETAG 002-1. In Annex B, table 2, the ETAs are listed in which the respective surfaces for bonding are defined. If other enamels or coatings of the glass panes are foreseen, the bonded area shall be left out from this enamelling or coating.

The coating is given in the "Declaration of Performance".

Furthermore it shall be observed that when using the coated glass according to EN 1096-4 as laminated safety glass the coated glass surface may not be oriented towards the PVB-interlayer.

The insulated glass unit shall comply with the regulations for insulating glass units as per EN 1279-5¹¹.

4	EN 572-9	Glass in building – Basic soda lime silicate glass products – Part 9: Evaluation of conformity/Product standard
5	EN 12150-2	Glass in building - Thermally toughened soda lime silicate safety glass - Part 2: Product standard
6	EN 1096-4	Glass in building - Coated glass - Part 4: Evaluation of conformity/Product standard
7	EN 14179-2	Glass in building - Heat soaked thermally toughened soda lime silicate safety glass - Part 2: Evaluation of conformity/Product standard
8	EN 1863-2	Glass in building – Heat strengthened soda soda lime silicate glass – Part 2: Evaluation of conformity/Product standard
9	EN 14449	Glass in building - Laminated glass and laminated safety glass - Product standard
10	EN 1288-3	Glass in building - Determination of the bending strength of glass - Part 3: Test with specimen supported at two points (four point bending)
11	EN 1279-5	Glass in building - Insulating glass units – Part 5: Evaluation of conformity

Use scenarios:

- 1a Use of monolithic exterior panes for the insulated glass unit (e.g. in Germany at installation height of more than 4 m): Heat-soaked thermally toughened soda lime silicate safety glass is required according to EN 14179-1¹² but with duration of the holding phase of four hours and involving a third party for controlling the heat-soaking process.
- 1b Use of monolithic exterior panes for the insulated glass unit (e.g. in Germany at installation height of less than 4 m): Thermally toughened soda lime silicate safety glass according to EN 12150-1¹³, -2 or according EN 14179-1, -2.
- 2a Use of laminated safety glass for the exterior or interior pane of the insulated glass unit according to EN 14449 with PVB-interlayer; Compound effects are not respected.
- 2b Use of laminated safety glass for the exterior or interior pane of the insulated glass unit according to EN 14449; Compound effects are respected regarding $G = 0.4 \text{ N/mm}^2$.

12	EN 14179-1	Glass in building - Heat soaked thermally toughened soda lime silicate safety glass – Part 1: Definition and description
13	EN 12150-1	Glass in building – Thermally toughened soda lime silicate glass – Part 1: Definition and description

Structural bonding and sealing

Bonding profiles

The bonding profiles made of anodised aluminium are used in combination with insulating glass and the given adhesives.

Table 1: Bonding profiles for insulating glass

Product	Art. No.	Surface condition	Adhesives that may be used
Bonding profiles made of EN AW 6060 aluminium as per EN 573-3 ¹⁴ , state T66 as per EN 755-2 ¹⁵	P165238 P160100 P160102 P160103 P160227	Anodised aluminium*: colours E6/C0 and E6/C35 by König Metallveredelung GmbH, Lauchringen, Germany, colours E6/C0 and E6/C35 by HD Wahl GmbH, Jettingen- Scheppach, Germany colours E6/C0 and E6/C35, by Fa. Königsdorf Oberflächentechnik GmbH & Co. KG, Wolfhagen, Germany	DOWSIL 993
Bonding profiles made of EN AW 6060 aluminium as per EN 573-3 state T66 as per EN 755-2	P165238 P160100 P160102 P160103 P160227	Anodised aluminium*: colours E6/C0 and E6/C35 by König Metallveredelung GmbH, Lauchringen, Germany, colours E6/EV1 and E6/C35 by HD Wahl GmbH, Jettingen- Scheppach, Germany	Sikasil SG 500
* The anodising process is to be conform to the specifications described in the test reports deposited in Deutsches Institut für Bautechnik.			

¹⁴ EN 573-3 Aluminium and aluminium alloys - Chemical composition and form of wrought products - Part 3: Chemical composition and form of products

¹⁵ EN 755-2 Aluminium and aluminium alloys - Extruded rod/bar, tube and profiles - Part 2: Mechanical properties

Adhesives

Table 2: Structural sealants

Structural sealant	Manufacturer	Associated ETA	Surfaces in addition to those assessed according to the associated ETA	Additional requirements
DOWSIL 993	DOW Europe GmbH	ETA-01/0005	For anodised aluminium Table 1 shall be observed.	The adhesion surface may be coated – before the actual sealing – with a (1.5 ± 0.5) mm thick sealant layer according to the method deposited with Deutsches Institut für Bautechnik. Only one of the following combinations (glass face – aluminium face) may be used thereby: DOWSIL 993 –DOWSIL 993 DOWSIL 3362 –DOWSIL 993
Sikasil SG 500	SIKA SERVICES AG	ETA-03/0038	For anodised aluminium Table 1 shall be observed.	The adhesion surface may be coated – before the actual sealing – with a (1.5 ± 0.5) mm thick sealant layer according to the method deposited with Deutsches Institut für Bautechnik. Only one of the following combinations (glass face – aluminium face) may be used thereby: SIKASIL SG 500 – SIKASIL SG 500 SIKASIL IG-25 – SIKASIL SG 500
DOWSIL 3362	DOW Europe GmbH	ETA-03/0003		Load-bearing edge seal

The properties of the structural sealant, such as the load-bearing capacity of the bonding, are given in the associated ETA for the structural sealant listed in Table 2.

Materials in contact

Only compatible materials may be installed adjacent to the structural sealant, and this compatibility is to be proven in the assessment procedure. Neighbouring materials may be used in the combinations specified in the following table.

Table 3: Effects of materials in contact (Annex 7)

Permissible combinations of structural sealants and materials in contact										
Manu-facturer	Structural sealant	Inner seal / butyl						Setting block/ formed part	Sealing/ weather joint	
		BU-S, Kömmerling	Terostat 969H.I.B. Fuller	Polybutylen GD 115 Kömmerling	Sika Glaze IG-5 PIB SIKA SERVICES AG	Fenzi Butyler, Fenzi Group S.p.a.	Naftotherm M82 Kömmerling	Silicone, M+S Silicon GmbH Co. KG	DOWSIL 791 DOW Europe GmbH	Sikasil WS 605 S SIKA SERVICES AG
DOW Europe GmbH	DOWSIL 993	X		X			X	X	X	
	DOWSIL 3362	X	X					X	X	
SIKA SERVICES AG	Sikasil SG 500		X	X	X	X		X		X

Details for the bonding process and the design

The bonding of the Trigon SG Insert Elements is only done in the manufacturing plants that are instructed by HUECK System GmbH & Co. KG. A list of authorized bonding shops is deposited with Deutsches Institut für Bautechnik. The processing guidelines of the companies HUECK System GmbH & Co. KG and of the manufacturer of the silicone sealant shall be respected.

The surfaces to be sealed may only be prepared in conformity with the manufacturing directives given by the sealant manufacturer.

Bubbles, holes or inclusions in the structural sealant are not permissible.

For the structural design calculation of the bonding the design rules of the Member State, in which the Trigon SG Insert Elements will be used, shall be respected.

Annex C

Characteristics and load-bearing capacities of the glazing supports, wind retaining devices and thermal barriers

Glazing supports (Annexes 5 and 6)

The self-weight of the glass panes is supported mechanically. At least 1/2 of the thickness of the exterior glass pane is supported. Setting blocks are used to prevent contact between steel and glass.

Table 4: glazing supports and glazing beads (load bearing capacity)

Support profile for	Art.-No.	Load bearing capacity for dead load F_{Rk} [kN] (for one glazing support, one element supported by two glazing supports)
Inner pane (glazing support)	996165	1.300
	996166	1.300
	996327	1.300
	996328	1.300
Outer pane (glazing beads)	419916	0.710
	419918	0.710

Wind retaining devices (emergency retainers)

In the case of bond failure, the horizontal wind suction loads are transmitted by emergency retainers. The necessity to use such emergency retainers is regulated by the respective Member States. The types of emergency retainers are seen in Annex 5.

Table 5: Retaining devices

Retaining devices (Art.-No.)	Length	Load bearing capacity for loading in direction of wind suction F_{Rk} [kN]
P419919	100 mm	1.372
P419917	100 mm	1.372

Thermal barriers

The Trigon SG Insert Elements contain polyamide thermal barriers. The material data are deposited with Deutsches Institut für Bautechnik.

The thermal barriers are only exposed to wind loads. No permanent load may stress the thermal barriers. The weight of the glass panes is transferred by the horizontal casement profiles to the vertical casement profiles via inserted metal corner connectors.

For Trigon SG Insert Elements thermal barriers in accordance with the following tables shall be used. The following values were determined in accordance with EN 14024¹⁶ for dimensioning (design) purposes (Annexes 3 and 4).

Table 6: Thermal barriers

Insulating struts K763890			
Temperature	-20 °C	+23 °C	+80 °C
Shear strength T_c [N/mm]	51.9	35.0	25.2
Transverse tensile strength Q_u [N/mm]	110.2	-	70.4
Elasticity constant for shear strength c [N/mm ²]	46	39	33
Reduction factor A_2	1.2		

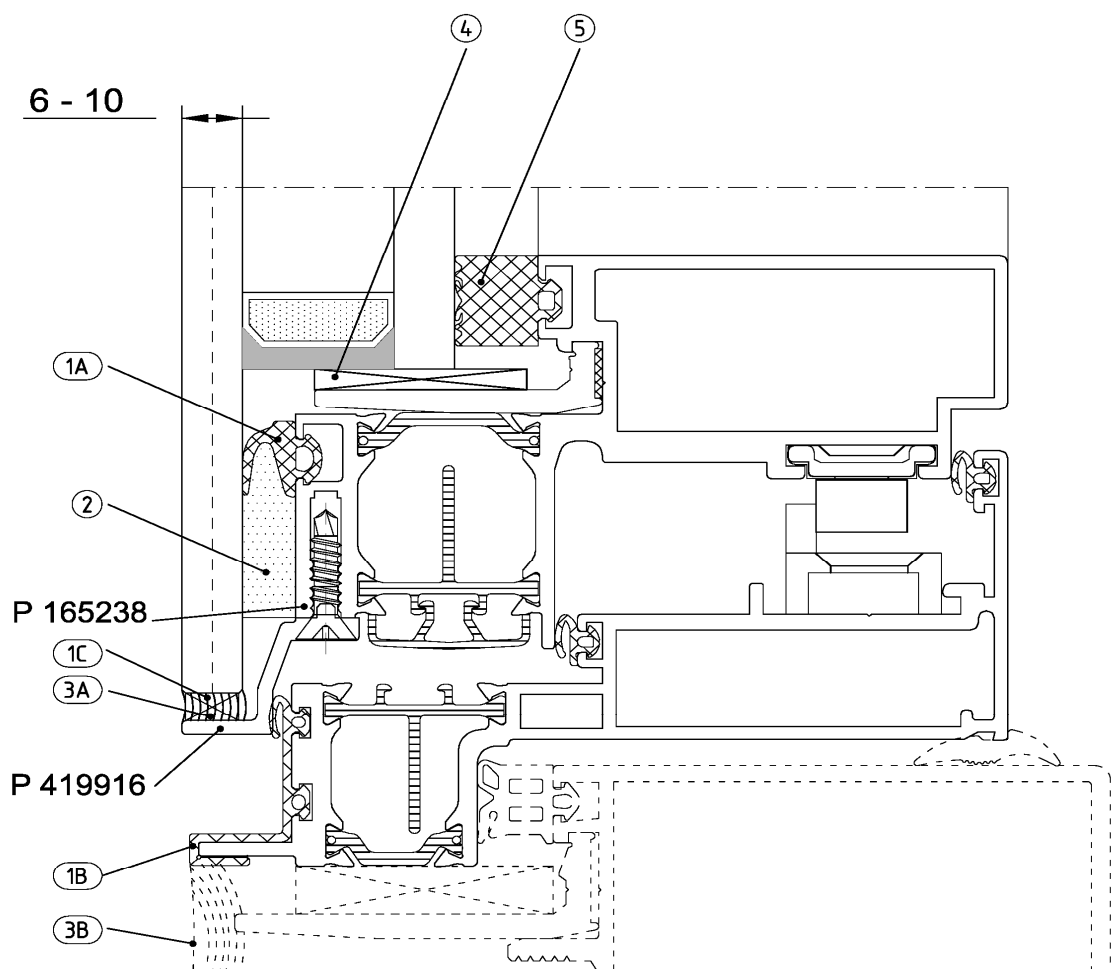
Insulating struts K763803			
Temperature	-20 °C	+23 °C	+80 °C
Shear strength T_c [N/mm]	77.8	50.4	39.2
Transverse tensile strength Q_u [N/mm]	107.3	-	94.6
Elasticity constant for shear strength c [N/mm ²]	63	49	40
Reduction factor A_2	1.2		

Insulating struts K900169, K900172, K900206			
Temperature	-20 °C	+23 °C	+80 °C
Shear strength T_c [N/mm]	50.1	43.8	38.1
Transverse tensile strength Q_u [N/mm]	83.5	-	60.5
Elasticity constant for shear strength c [N/mm ²]	46	40	36
Reduction factor A_2	1.0		

¹⁶ EN 14024 Metal profiles with thermal barrier - Mechanical performance - Requirements, proof and tests for assessment

- | | | |
|----|--|--|
| ①A | Silikondichtung - Dichtungslippe | / Silicon gasket - sealing lip |
| ①B | Silikondichtung - Dichtungsrahmen | / Silicon gasket - sealing frame |
| ①C | Silikondichtung - Klotz | / Silicon gasket - setting block |
| ② | Klebesystem | / Bonding system |
| ③A | Wetterfuge | / Weather joint |
| ③B | Wetterfuge (Kein direkter Kontakt Klebung) | / Weather joint (No direct Contact to bonding) |
| ④ | Glassträger + Silikonauflage | / Glass support + Silicon overlay |
| ⑤ | EPDM Dichtung | / EPDM gasket |

Zweifachverglasung
(Double glazing)



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Trigon SG Insert Elements

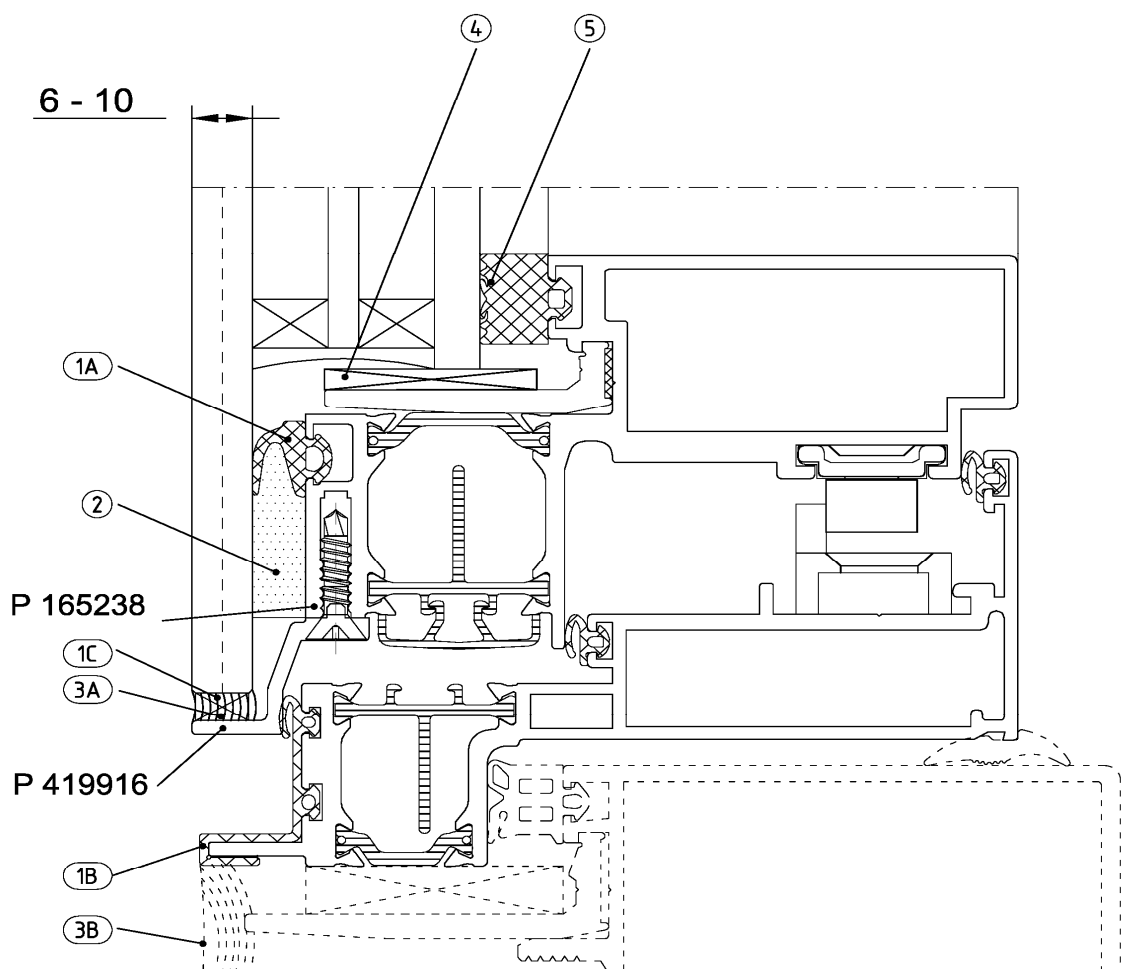
Detail vertical section – double glazing

Annex 1

English translation prepared by DIBt

- | | | |
|----|--|--|
| ①A | Silikondichtung - Dichtungslippe | / Silikon gasket - sealing lip |
| ①B | Silikondichtung - Dichtungsrahmen | / Silikon gasket - sealing frame |
| ①C | Silikondichtung - Klotz | / Silikon gasket - setting block |
| ② | Klebesystem | / Bonding system |
| ③A | Wetterfuge | / Weather joint |
| ③B | Wetterfuge (Kein direkter Kontakt Klebung) | / Weather joint (No direct Contact to bonding) |
| ④ | Glassträger + Silikonauflage | / Glass support + Silicon overlay |
| ⑤ | EPDM Dichtung | / EPDM gasket |

Dreifachverglasung
(Triple glazing)



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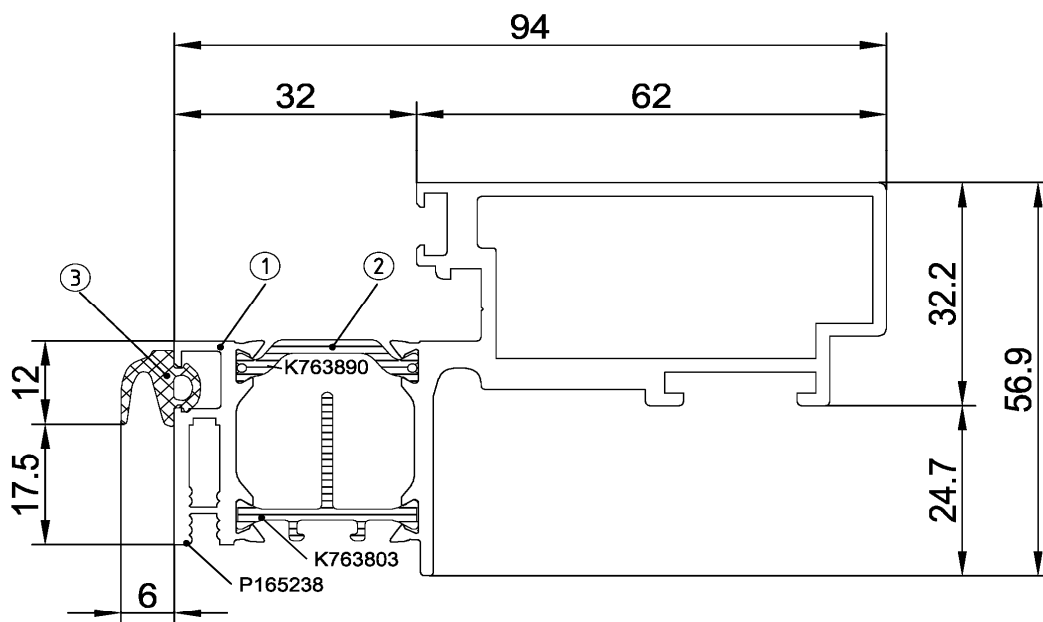
Trigon SG Insert Elements

Detail vertical section – triple glazing

Annex 2

- ① Anschlussprofil Verklebung / sealant adaptor profile
- ② Isolatorsteg / insulating bar
- ③ Silikondichtung / gasket

PAF Type 2 / PAF Type 2a
Flügel / sash



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Triglon SG Insert Elements

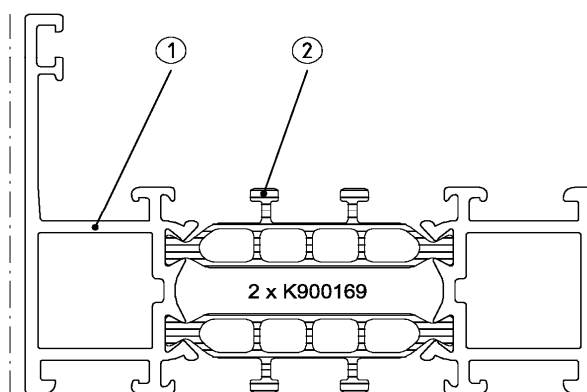
Sealant adaptor P165238 and sash profile

Annex 3

Festverglasung Type 2
Fixed glazing

- ① Rahmenprofil
- ② Isolatorsteg

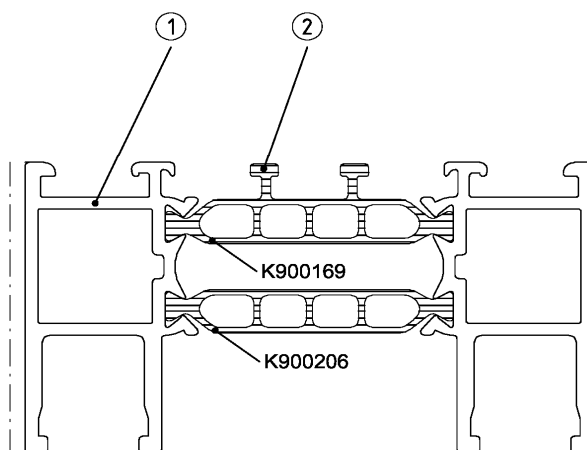
/ frame profile
/ insulating bar



Festverglasung Type 2
Fixed glazing

- ① Rahmenprofil
- ② Isolatorsteg

/ frame profile
/ insulating bar

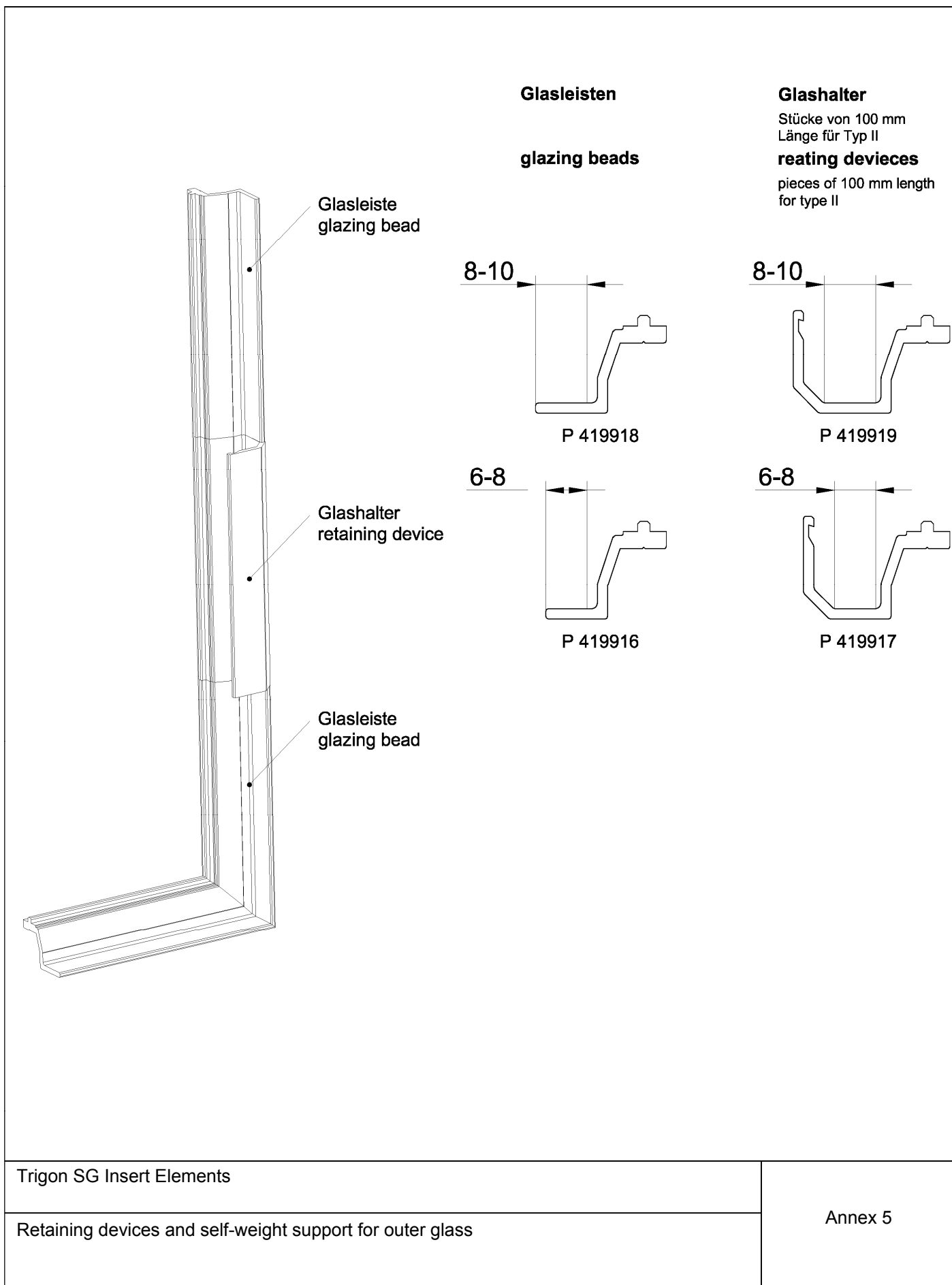


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Trigon SG Insert Elements

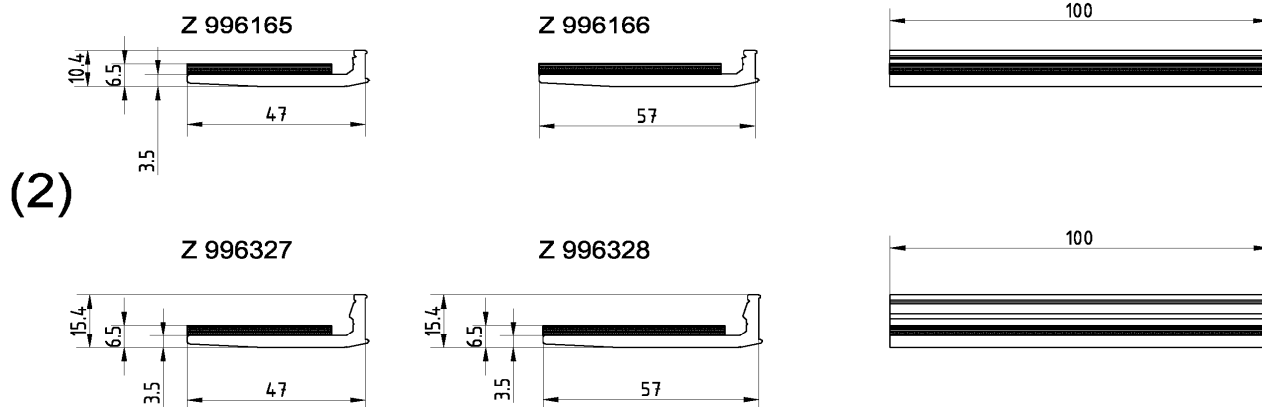
Sealant adapter and isolating bars

Annex 4

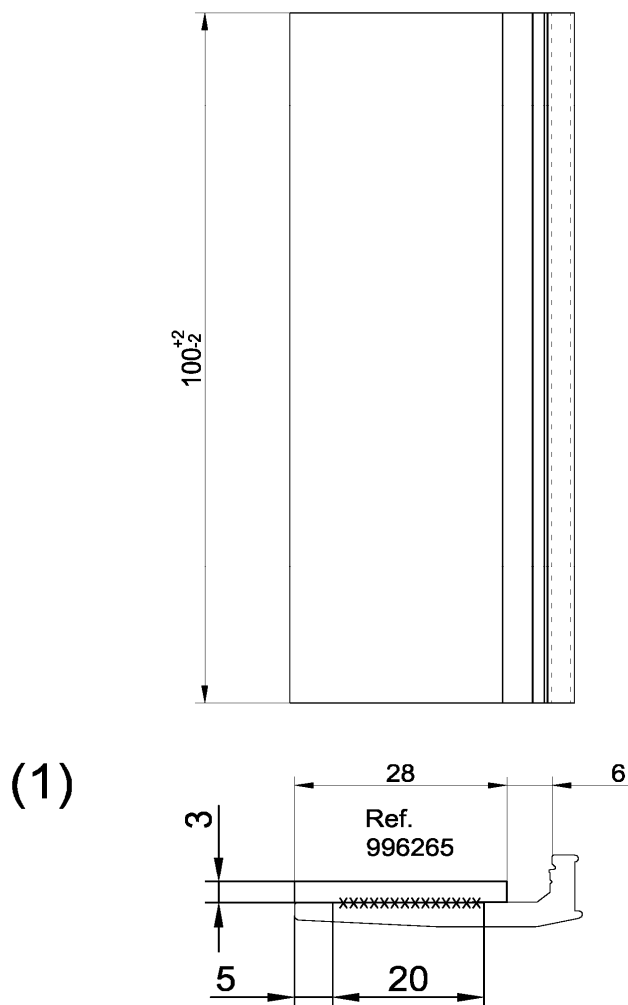


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M 1:2



M 1:1

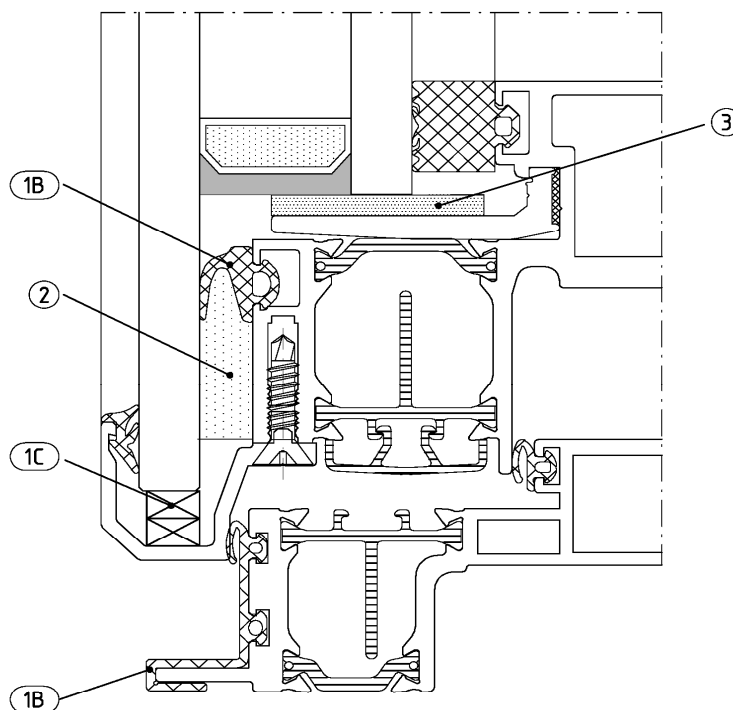


Trigon SG Insert Elements

Self-weight support for inner glass (1) and outer glass (2)

Annex 6

Positonsnr.:	Einsatzproduct (Insert product)	Prüfung mit Produkt: (Test with product)	Hersteller (Manufacturer)
1A / B / C	Silikondichtung - Dichtungslippe - Dichtungsrahmen - Klotz	Sikasil SG-500	Fa. Sika
		Sikasil IG-25	
2	Klebesystem	DOW Corning 993	Fa. DOW CORNING S.A.
		DOW Corning 3362	
3	Glasträger mit Siliconauflage	Sikasil SG-500	Fa. Sika
		Sikasil IG-25	
		Dow Corning 993	Fa. DOW CORNING S.A.
		Dow Corning 3362	



Trigon SG Insert Elements

Compatibillty

Annex 7