



EUROPEAN ASSESSMENT DOCUMENT

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POINT SUPPORTED VERTICAL GLAZING

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

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SCOPE OF THE EAD

1.1 Description of the construction product

This EAD is applicable to "Point supported vertical glazing" which is consisting of the following components, the essential characteristics of which are described in 2.2.1:

- Thermally toughened glass panes or thermally toughened enamelled or satin finished glass panes according to EN 12150-2 with deviating characteristic bending strength, heat soaked or not according to EN 14179-2 used in single glazing with countersunk holes,
- Thermally toughened glass panes or thermally toughened enamelled or satin finished glass panes with countersunk holes used as laminated safety glass according to EN 14449,
- Heat strengthened glass panes or heat strengthened enamelled or satin finished glass panes according to EN 1863-2 with countersunk holes used as laminated safety glass according to EN 14449,
- Prefabricated point fastener made of countersunk head screw with internal thread,
- Further additional components such as silicone washer, plastic distance sleeve, resin filler and adapter for hinge bolt (optional).

The rectangular glass panes have at least 4 countersunk drilled holes into which countersunk head screws of stainless steel are factory-mounted as point support. The pre-mounted elements are connected via an internal screw thread in the countersunk head screws and a second screw directly or via hinge bolt with the substructure.

The thermally toughened glass panes are manufactured with a minimum thickness of 8 mm. The glass panes have dimensions up to 3,30 m x 8,00 m in due consideration of the result of the structural analysis. Contact between glass and steel is avoided by the use of plastic distance sleeves and washers.

The product "Point supported vertical glazing" is a kit¹ which includes constituent materials and components (see Figure 1).

¹ "Kit" means a construction product placed on the market by a single manufacturer as a set of at least two separate components that need to be put together to be incorporated in the construction works (Art 2 no 2 CPR).

Pos	Description	Pos	Description
1	Nut	4	Conial spacer
2	Countersunk Bolt	5	Resin filler
3	Silicone Ring </td <td>6</td> <td>Adapter for hinge bolt</td>	6	Adapter for hinge bolt

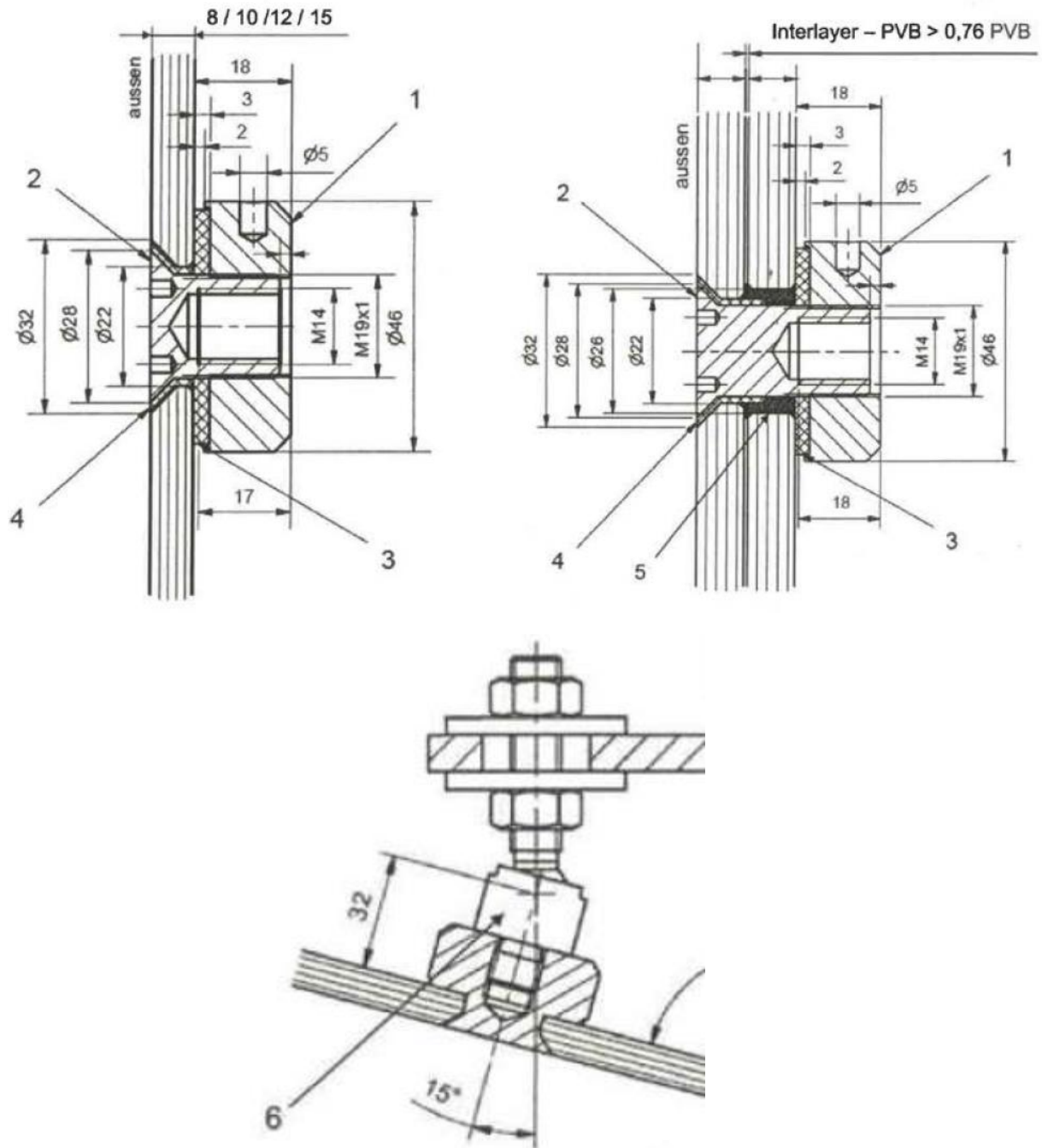


Figure 1 Point supported vertical glazing

The product is not covered by a harmonised European standard (hEN).

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use of the construction product

1.2.1 Intended use

The elements can be used for ventilated curtain wall façades or for internal space-enclosing vertical glazing.

The fixation of the elements for the intended use is provided free of strains to a suitable substructure, vertically or with an inclination to the supporting structure up to 10° to the vertical.

The point supported glazing is not designed for stiffening other elements and not for use as function as barrier against falling down.

Verification of stability of the substructure is not subject of this EAD procedure.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the "Point supported vertical glazing" for the intended use of 25 years when installed in the works provided that the "Point supported vertical glazing" is subject to appropriate installation (see 1.1). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works².

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD (if necessary in addition to the definitions in CPR, Art 2)

1.3.1 Components

Countersunk Bolt - point fastener for fixing the glass panes to the substructure

Silicone ring layer to avoid contact between glass and metal

² The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

- Conial spacer - spacer to avoid contact between glass and metal
- Resin filler - material to avoid contact between glass and metal

1.3.2 Assessment

- F - force in general [N]
- E - modulus of elasticity [N/mm²]
- G - shear modulus [N/mm²]

ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

1.4 Essential characteristics of the product

Table 1 shows how the performance of "Point supported vertical glazing" is established in relation to the essential characteristics.

Table 1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance <i>(level, class, description)</i>
Basic Works Requirement 1: Mechanical resistance and stability			
1	Characteristic load bearing capacity and displacements Probability of NiS-induced (Nickel Sulphide) failure of tempered glass	2.2.1 2.2.2 2.2.3	Characteristic bending strength of the different glass products Heat-soaking process Compound effect of laminated glass Elastic modulus of materials between glass and metal Adhesion behaviour
Basic Works Requirement 2: Safety in case of fire			
2	Reaction to fire	2.2.4	Single glass panes and point fastener satisfy the requirements for the fire reaction class A1 Classification of laminated safety glass
3	Resistance to fire	2.2.5	Classification is depending on the substructure and therefore the class should be determined for the individual case

To facilitate the expression of different performances of the product with regard to combinations of essential characteristics referred to in Table 1 distinction is made between the following use scenarios:

- 1a / 1b: For the use of glass products different levels are defined according national provisions regarding the position of the glazing in the building and the probability of NiS-induced failure of tempered glass
- 2a / 2b: For the consideration of the compound effect of laminated safety glass

- 3a / 3b: For the use of laminated safety glass in the façade due to the fire reaction class

Use scenario 1a: When single panes of thermally toughened glass (mono panes) shall be used in the façade, the panes should be heat soaked. In deviation from the standard EN 14179-1 the duration of the holding phase is 4 hours. In addition the company involved in processing the heat soak test should be controlled by a notified body.

Use scenario 1b: There is no restriction for the use of single panes of thermally toughened glass (mono panes).

Use scenario 2a: For the bond behaviour of laminated safety glass a ball drop test according Annex A shall be performed. It is not allowed to consider a compound effect when designing the glass panes.

Use scenario 2b: The ball drop test according Annex A is not required. For the design of the glass panes (laminated safety glass) a compound effect may be considered, respecting $G = 0,4 \text{ N/mm}^2$.

Use scenario 3a: There is a restriction for the use of laminated safety glass in the façade dependent on the fire reaction class. National provisions shall be observed.

Use scenario 3b: There is no restriction for the use of laminated safety glass in the façade. National provisions shall be observed.

1.5 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

The kit was already placed on the market according 89/106/EEG. Therefore long term experience on site is provided.

1.5.1 Characteristics for the glass products of the kit

For the glass products thermally toughened glass, thermally toughened enamelled or satin finished glass as well as for heat-soaked glass the characteristic bending strength is defined deviating from the definition in EN 12150-2 and EN 14179-2. Tests according EN 1288-3 are required. In addition the fragmentation test according to EN 12150-2 should be passed with at least two panes of the maximum size per thickness of the glass panes.

For the glass products heat strengthened glass according to EN 1863-2, heat strengthened enamelled or satin finished glass tests to determine the characteristic bending strength according EN 1288-3 are required. In addition the fragmentation test should be passed according to EN 1863-2 with at least two panes of the maximum size and five panes 1000 mm x 1500 mm per thickness of the glass panes.

For laminated safety glass according EN 14449 an interlayer made of polyvinyl butyral (PVB) is required. Tear strength and elongation at rupture of the PVB-interlayer shall be determined according to EN ISO 527-3 with a test speed of 50 mm/min at 23 °C. The adhesive behaviour (see 2.1) for use category 2a / 2b shall be respected.

1.5.2 Characteristic of the point fastener

If the metal parts are commercial standard parts supplied by another party than the assessment holder then material, dimensions and mechanical properties of the metal parts given in the ETA shall be confirmed by inspection certificate 3.1 according to EN 10204:2004.

1.5.3 Properties of the materials between glass and metal

For the silicone ring, the conical spacer and the resin filler the elastic modulus are required. For the design of the glass panes (Finite Element calculation) limit values (minimum and maximum) should be respected, due to the viscoelastic behaviour of the materials and the varying of the elastic modulus for different temperatures. As basis for the estimation investigations regarding EN ISO 6721-1 are optional.

1.5.4 Reaction to fire

1.5.4.1 Assembled system

The reaction to fire behaviour of the kit depends on the reaction to fire behaviour of the glass panes. The fasteners are considered to satisfy the requirements for performance class A1 of the characteristic reaction to fire, in accordance with the provisions of EC Decision 96/603/EC (as amended) without the need for testing on the basis of its listing in that decision. Therefore only the components need to be tested and classified separately.

2.2.4.2 Components

Glass panes – Case 1:

The thermally toughened glass panes are considered to satisfy the requirements for performance class A1 of the characteristic reaction to fire, in accordance with the provisions of EC Decision 96/603/EC (as amended) without the need for testing on the basis of its listing in that decision.

Glass panes – Case 2:

The laminated safety glass shall be tested, using the test methods relevant for the corresponding reaction to fire class, in order to be classified according to EN 13501-1 (see Annex B).

Point fastener:

The metal components of the point fastener can be classified to class A1 in accordance with the provisions of EC Decision 96/603/EC (as amended) without the need for testing on the basis of its listing in that decision.

The other materials of the point fastener (silicone ring, conical spacer, resin filler) can be considered to satisfy any reaction to fire requirements. These components are embedded in the point fastener. They can be considered not to influence the reaction to fire class of the single point supported vertical glazing (Technical Report 021: Reaction to fire requirements for small components; June 2005).

1.5.5 Resistance to fire

The part of the works or assembled system in which the "Point supported vertical glazing" is intended to be incorporated, installed or applied shall be tested, using the test method relevant for the corresponding fire resistance class, in order to be classified according to the appropriate part of EN 13501.

The part of the works or assembled system in which the "Point supported vertical glazing" is intended to be incorporated, installed or applied shall be classified according to the appropriate part of EN 13501.

ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

1.6 Systems of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is: Decision 2003/656/EC

The system for the kit (single point supported vertical glazing) is: **1**

In addition, with regard to e.g. reaction to fire for products covered by this EAD the applicable European legal act is: Decision 2003/656/EC

The systems are: **1 / 3 / 4**

1.7 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the kit in the procedure of assessment and verification of constancy of performance are laid down in Table 2.

Table 2 Control plan for the manufacturer; cornerstones

No	Subject/type of control (<i>product, raw/constituent material, component</i> - <i>indicating characteristic concerned</i>)	Test or control method (<i>refer to 2.2 or 3.4</i>)	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Dimensions and tolerances	Measuring and visual check	Acc. control plan	Acc. control plan	Continuously
2	Mechanical properties	e.g. bending test, heat soak test.	Acc. control plan	Acc. control plan	Continuously

1.8 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for the kit are laid down in Table 3.

Table 3 Control plan for the notified body; cornerstones

No	Subject/type of control <i>(product, raw/constituent material, component - indicating characteristic concerned)</i>	Test or control method <i>(refer to 2.2 or 3.4)</i>	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control <i>(for systems 1+, 1 and 2+ only)</i>					
1	Ascertain that the factory production control and the staff as well as the equipment are suitable to ensure a continuous and orderly manufacturing of the glass panes and the fastener		Acc. control plan		
Continuous surveillance, assessment and evaluation of factory production control <i>(for systems 1+, 1 and 2+ only)</i>					
2	Verifying that the system of factory production control and the manufacturing process are maintained taking account to the control plan The heat soak process should be controlled by a notified body		Acc. control plan		Twice a year

REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment is of relevance.

EN 1288-3:2000	Glass in building - Determination of the bending strength of glass – Part 3: Tests with specimen supported at two points (four point bending); appropriate version
EN 1863-2:2004	Heat strengthened soda lime silicate glass - Part 2: Evaluation of conformity/Product standard; appropriate version
EN 1990	Eurocode: Basis of structural design; EN 1990:2002 + A1:2005 + A1:2005/AC:2010
EN 10088-3:2005	Stainless steels - Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes
EN 10204:2004	Metallic products - Types of inspection documents
EN 12150-2:2004	Glass in building - Thermally toughened soda lime silicate safety glass – Part 2: Evaluation of conformity/Product standard; appropriate version
EN 12600:2002	Glass in building – Pendulum test – Impact test
EN 13501-1:2010	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN 14179-1:2005	Heat soaked thermally toughened soda lime silicate safety glass – Part 1: Definition and description
EN 14179-2:2005	Heat soaked thermally toughened soda lime silicate safety glass – Part 2: Evaluation of conformity/Product standard; appropriate version
EN 14449:2005	Glass in building - Laminated glass and laminated safety glass - Evaluation of conformity/Product standard; appropriate version
EN ISO 527-3:1995/AC:2002	Plastics – Determination of tensile properties – Part 3: Test conditions for films and sheets
EN ISO 6721-1:2011	Plastics – Determination of dynamic mechanical properties – Part 1: General Principles

ANNEX A BALL DROP TEST

Scope of application and objective

The ball drop test serves to test the behaviour of laminated glass in case of an impact-like hit of a hard impactor with small compact mass.

Equipment

Ball made of rolling bearing steel with a diameter of 63,50 mm (mass approx. 1030 g).

Fall mechanism

A mechanism for holding and releasing the dropping object (e.g. an electromagnet), which allows adjusting the drop height of 4 m and does not give any impulse to the dropping object so that it will be accelerated by the gravitational force only and falls perpendicularly.

Holding device for the sample

The holding device (see Figure 1) consists of two frames of hot-rolled flat steel. The edge surfaces of the frames processed to fit together have a width of 15 mm and are covered with a 3 mm thick and 15 mm wide frame of rubber strips of a hardness of (40 ± 10) IRHD. The upper frame weighs approx. 7 kg. The holding device is placed on a base plate of steel with a thickness of 12 mm. Between the base plate of steel and the base is a sandwich layer made of 3 mm thick rubber with a hardness of (40 ± 10) IRHD.

Samples

At least five samples of the following setup shall be examined: 3 mm float glass (0,38 mm PVB film / 3 mm float glass; length of sample = width of sample = (500 ± 5) mm.

The samples shall be plane. Before the test they shall be stored for at least four hours at test temperature.

Execution

The test temperature is (23 ± 2) °C.

The sample is placed in the holding device, the drop height (lower edge of dropping object to surface of sample) adjusted to (4000 ± 40) mm and the dropping object released. The dropping object shall not hit the sample more than 50 mm off the sample centre; otherwise the test shall be repeated with a new sample.

Result

The test is passed when the ball does not penetrate the sample.

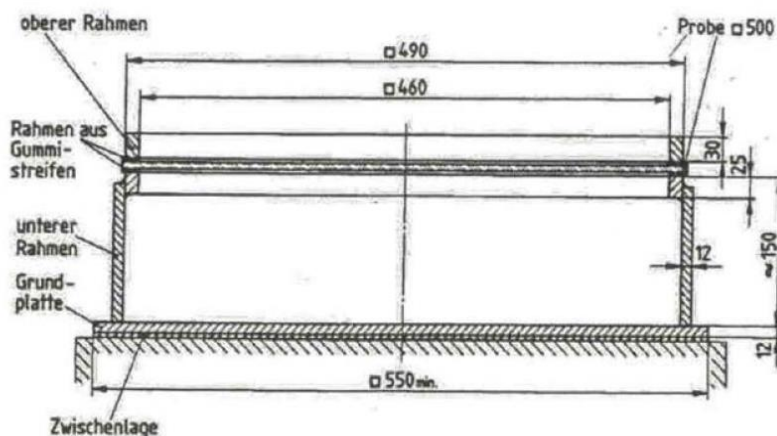


Figure 1: Holding device for the ball drop test)

ANNEX B TEST PROPOSAL ON THE VERIFICATION OF THE REACTION TO FIRE OF "POINT SUPPORTED VERTICAL GLAZING" ACCORDING TO EN 13501-1 (SYMMETRICAL COMPOSITION)

1 Testing according to EN 1182

It is expected that this standard will not be applied; otherwise it shall be examined in accordance with the standard.

2 Testing according to EN 1716

2.1 Glass panes

The glass panes are classified in class A1 according to Commission Decision 96/603/EC (as amended). The heat value (PCS value) amounts to 0 MJ/kg.

2.2 Intermediate layers

For the intermediate layers, such as foils (PVB), etc. the heat value (PCS value) shall be determined according to the standard. (If the admissible PCS value for an A1 construction material is exceeded testing the laminated glass shall be performed according to EN 13823 in order to classify the construction product according to EN 13501-1).

2.3 Point-fasteners

The metal components of the point-fasteners are classified in class A1 according to Commission Decision 96/603/EC (as amended). The combustible components do not considerably contribute to the fire spread. Therefore the verification of reaction to fire can be done without testing (cf. "small components document" endorsed by the EOTA TB).

3 Testing according to EN 13823

Relevant parameters for this test method:

- composition of the laminated safety glass
- type and thickness of the glass used for the glass panes
- type (chemical composition) and thickness of the PVB-interlayer
- joint arrangement

General remarks on the set-up of the test specimen:

The test specimen shall be tested with a horizontal joint in the long wing at a height of 500 mm from the bottom edge and with a vertical joint in the long wing at a distance of 200 mm from the corner line, measured when the wings are mounted ready for testing.

Both wings of the specimen shall be assembled according to EN 13823 Figure 2 in a free standing position. The instructions of EN 13823 clause 5.2.2 a) have to be considered.

The glazing shall be fixed to a metal frame using appropriate point fasteners.

The distance between backside of the specimen and backing board shall be at least 80 mm. The pointwise support of the specimen also allows for free ventilation behind the specimen.

Note: If during testing the specimen collapses, the test cannot be evaluated.

Testing with the smallest thickness of the glass panes (per type of glass to be used) with the PVB-interlayer which shows the largest thickness and which verify the highest heat value (PCS value) according to EN ISO 1716.

The results with the smallest thickness of the glasses will also include the use of larger glass thickness.

The use of a PVB-interlayer with the largest thickness and the most critical heat value also includes the use of intermediate layers with the same or a smaller thickness and a smaller heat value.

4 Testing according to EN ISO 11925-2

Relevant parameters to be observed when performing this test:

- composition of the laminated safety glass
- type and thickness of the glass used for the glass panes
- type (chemical composition), number and thickness of the PVB-interlayer

Test program suggested:

Three tests each with edge flame attack and on samples turned on 90 degrees on the laminated safety glass panes with the most critical result from the SBI test and heat value determination.

From the variant, which shows the most unfavourable test results regarding reaction to fire, three more test are carried out. These results are consulted as basis for the classification. The result applies to all aforementioned variants and applications.