Test Report

No. 509 19675e*

*) This is a translation of Test Report No. 509 1675 dated 6 July 1999

Report date 23 May 2007

Client

Altenloh, Brinck & Co.
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58256 Ennepetal
Germany

Order Component test of the SPAX frame anchor

Object Fastening system - SPAX frame anchor

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1 Order

Component test of the SPAX frame anchor manufactured by Altenloh, Brinck & Co., 58256 Ennepetal, Germany, for fixing of plastic windows. The component test is based on a sequence of test cycles with exposure to climatic and mechanical loads. The fasteners are exposed to tensile, compression and shear loads and to the interaction between these loads. The accelerated test in the laboratory serves to determine creep- and ageing-induced changes in the mounting area.

2 Object

For the testing of the fastener, a plastic window was mounted in a model wall using the SPAX frame anchor. Fig. 1 shows the SPAX frame anchor.

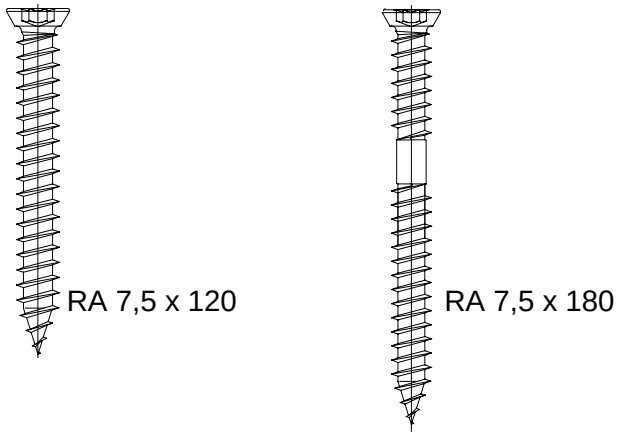

Fig. 1 SPAX frame anchors*)

The SPAX frame anchor is available in nominal lengths of between 40 and 210 mm depending on the design, and a diameter of 7.5 mm. For fixing the window, type RA 7.5 x 120 anchors were used at the top and bottom (Fig. 1) and type RA 7.5 x 180 (Fig. 1 right and Fig. 2) anchors were used at the sides.

Fig. 3 shows the test specimen. The wall construction comprises perforated bricks HLZ 240/240/115 as per DIN 105-2. With a wall opening of approx. 1270 mm × 1520 mm and window size of 1230 mm × 1480 mm, the width of the perimeter joint is approx. 20 mm.

) Note

This figure is based on documentation supplied by the client and has not been checked fully for technical correctness.

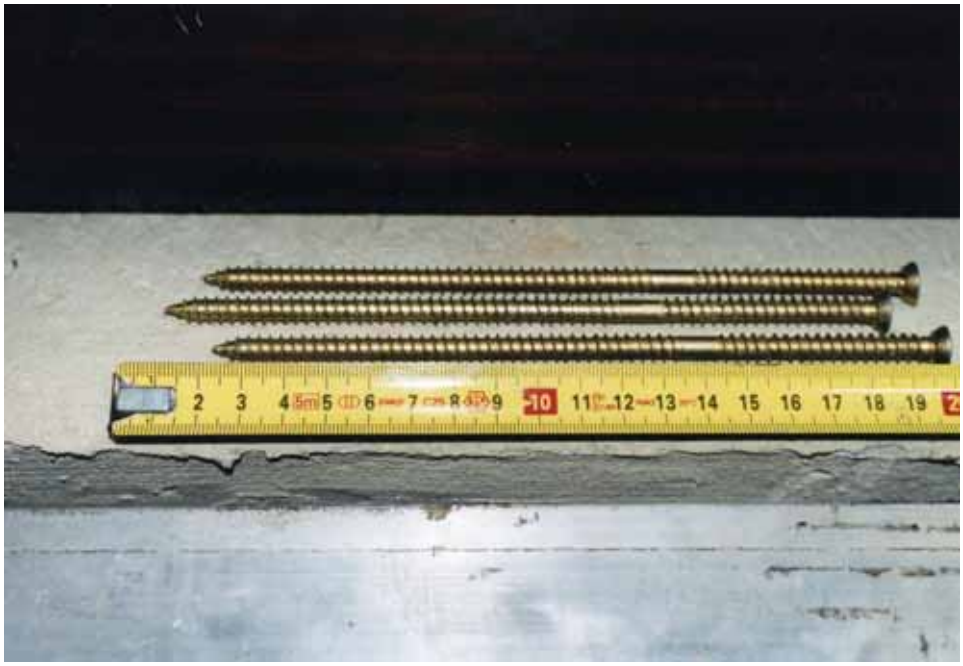

Fig. 2 SPAX frame anchors used for the component test

The built condition (e.g. plaster covering parts of the frame or in-situ foaming of the joint) has no influence on the fixing. Fixing, and hence loads perpendicular to the plane of the window, are accommodated by the SPAX frame anchors; loads at the window plane are accommodated by the blocking system of the company Gluske.

The window consists of mass-coloured dark PVC profiles (3-chamber profile) and is reinforced with metal stiffening components in accordance with the system specifications. The glazing system is an insulating glass unit, type sound insulation unit, pane configuration: 4/16/8. Casement weight: 54 kg.

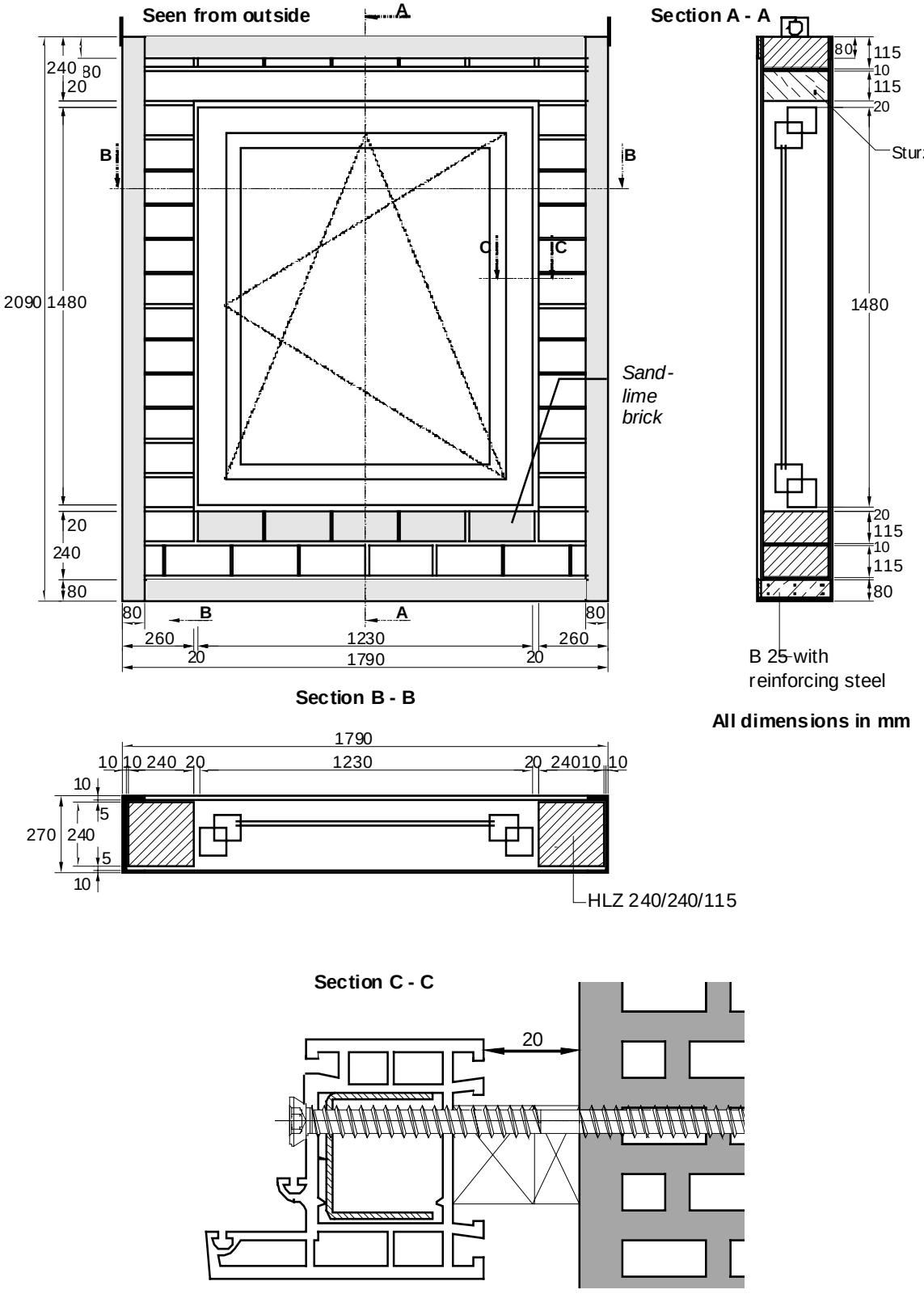

Fig. 3 Test specimen

3 Procedure

3.1 Installation of the window

The window was installed by the client. The frame was placed in the opening, fitted using the adjustable setting blocks of the company Gluske and temporarily fixed by means of wedges. It was then pre-drilled, and the SPAX frame anchors were inserted around the perimeter according to the specifications regarding spacings between fasteners for plastic windows as set out in the “Installation Guideline” of the RAL Quality Assurance Association for Windows and External Pedestrian Doors. Fig. 4 shows the position of the fixing points B1 to B 10.

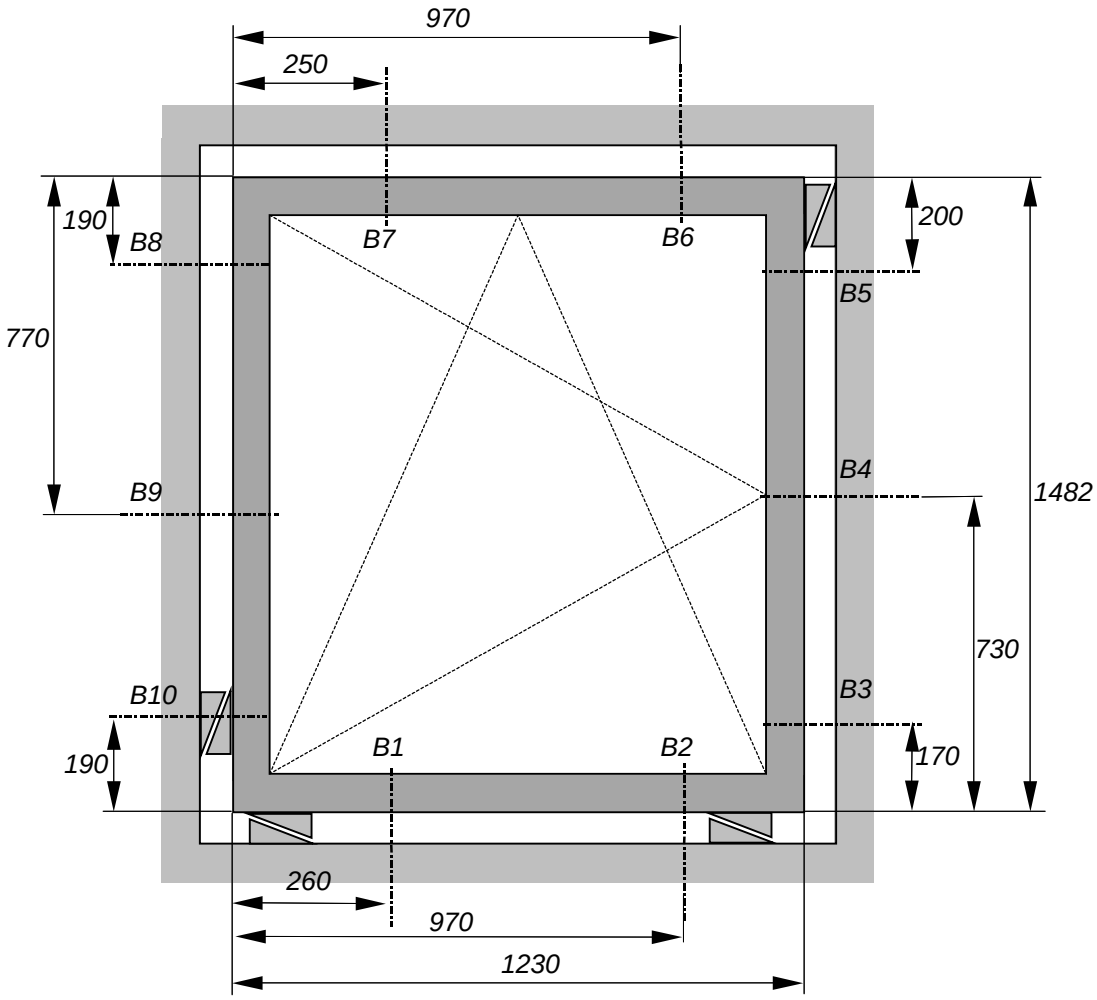

Fig. 4 Schematic representation of the fixing points and position of setting blocks

3.2 Test

3.2.1 Initial type test

1. Visual inspection of the position and arrangement of the fasteners in the window and towards the wall,
2. Testing of operating forces,
3. Deformation of the window in the initial condition and under application of a 500 N load to the edge of the casement as per DIN 18055. The displacement of the window in the mounting area was recorded by a total of 20 linear potentiometers. Fig. 5 shows the positions of the linear potentiometers. Fig. 6 shows part of the test setup.

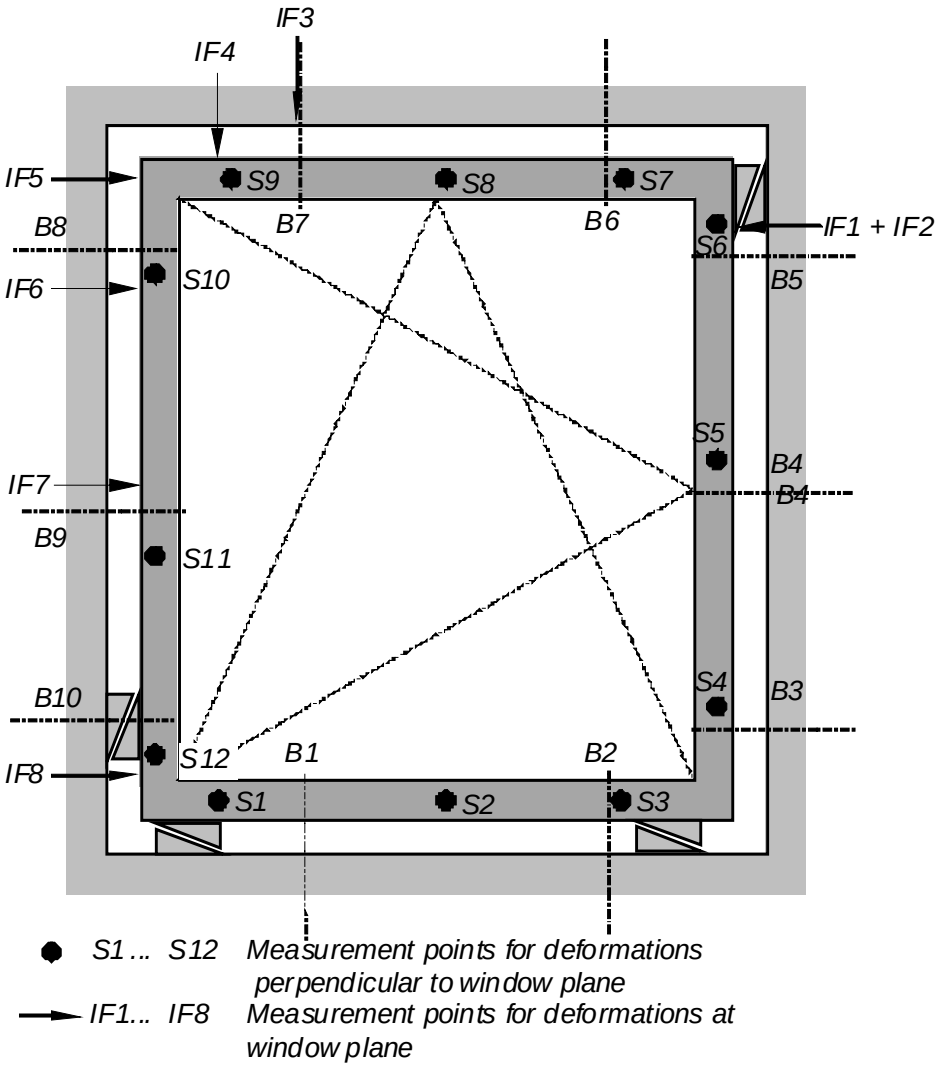

Fig. 5 Schematic representation of the positions of the linear potentiometers

Furthermore, during load application the fasteners of the test specimen were checked for visible changes.

Fig. 6 Test setup

3.2.2 Loading test

1. Application of a series of positive/negative test pressures (± 600 Pa) as per prEN 12211.
2. Exposure of the external face to changing temperatures (20 cycles as schematically represented in Fig. 7). During thermal cycling, the internal face of the window was exposed to ambient conditions.

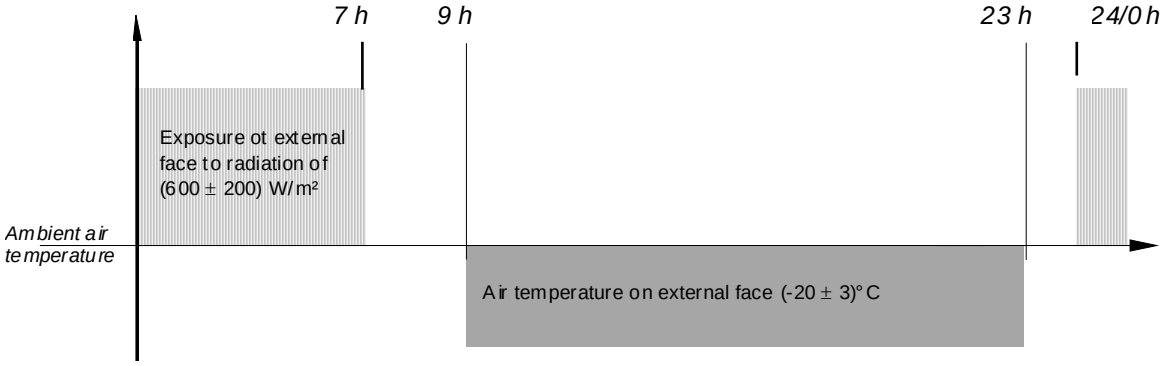

Fig. 7 Thermal cycling (one cycle = 24 h)

3. Simulated operation via 10,000 hardware operations as per DIN 18055. The casement is brought 10,000 times into the tilt position, closed, opened, closed.
4. Application of a series of positive/negative test pressures (± 600 Pa) as per prEN 12211.

3.2.3 Final test

1. Deformation of the window in the final condition following loading – application of a 500 N load to the edge of the casement as per DIN 18055.
2. Testing casement for operating forces.
3. Application of positive/negative test pressures (static) as per prEN 12211; safety test with maximum achievable pressure.
4. Evaluation by visual inspection of the position and arrangement of the fasteners in the window and towards the wall in comparison with the initial test.

All tests were conducted at standard atmosphere, unless stated otherwise.

4 Results

4.1 Initial type test

4.1.1 Evaluation by visual inspection of the position and arrangement of the fasteners in the window and towards the wall

The SPAX frame anchors were applied to the frame in the area of the main chamber. The frame anchor was drawn into the frame up to the screw head, while ensuring that the frame did not become deformed.

The frame anchor RA 7.5 x 180 was retained firmly by at least two walls of the side brick. The top fixing ran into the precast lintel, therefore the RA 7.5 x 120 frame anchors were used. The downward fixing ran into sand-lime brick. The screws held firmly at the top and bottom.

Fig. 8 shows the blocking and the SPAX frame anchor in the top right corner (seen from inside).

Fig. 8 Fixing and blocking at the top corner

4.1.2 Testing of operating forces

The action of the window handle was smooth-running, and the window could be easily opened. The operating forces of approx. 3 Nm lay below the 10 Nm permitted by the quality regulations and test specifications of the RAL Quality Assurance Association for Windows and External Pedestrian Doors.

4.1.3 Deformation of the window in the initial condition with application of 500 N load to the edge of the casement as per DIN 18055

The casement, opened to an angle of approx. 90°, was exposed to an additional load of 50 kg on the locking side. After a loading time of 25 minutes, the additional weight was removed and the window closed. The measured values are presented in Fig. 10. The deformation of the window was reversible; no permanent deformations or visible changes occurred, as shown in Fig. 11.

4.2 Loading test

4.2.1 Application of a series of positive/negative test pressures

The external face of the test specimen was exposed to a series of positive/negative test pressures of ± 600 Pa (intervals of 30 seconds, 20 cycles). The deformations of the window were reversible; no permanent deformations or visible changes occurred.

4.2.2 Thermal cycling

Heating by solar radiation on the “external face” of the test specimen was simulated using radiation sources with an intensity of (600 ± 200) W/m² as per DIN 52344. Subsequently an external air temperature of (-20 ± 3)°C was generated using a climatic chamber. The diagram below (Fig. 9) shows the surface temperature of the frame over one cycle.

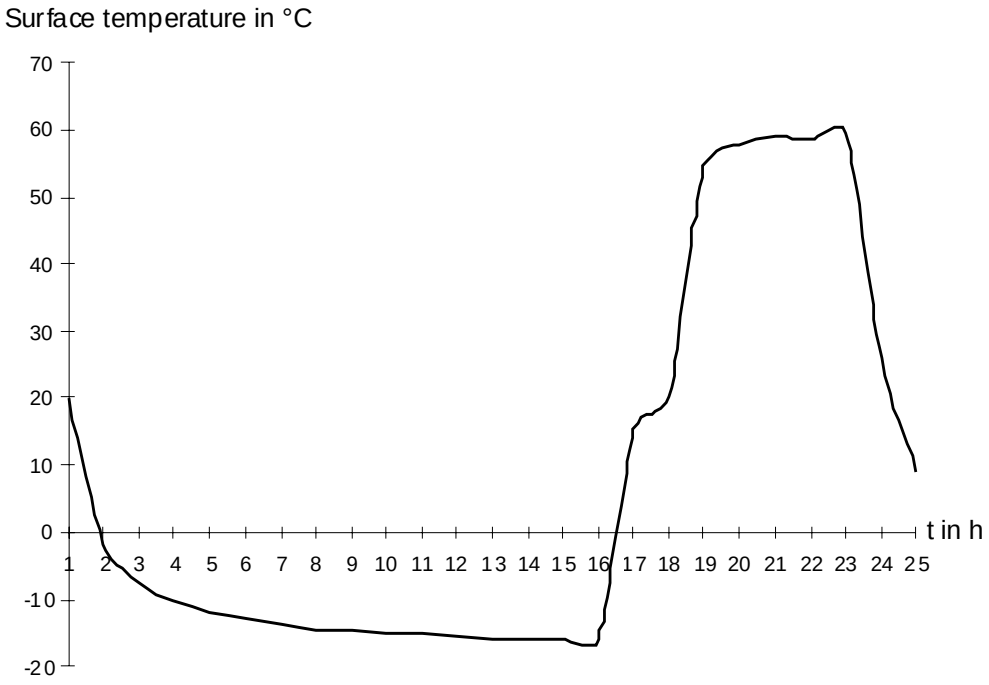

Fig. 9 Curve of surface temperature on the frame

4.2.3 Simulated operation as per DIN 18055

The temperature changes caused the casement to lower. This “lowering” took place to the usual extent and could be compensated by the adjustment facility of the hinges. Following simulated operation, no permanent deformations or visible changes were noted.

4.2.4 Application of a series of positive/negative test pressures

The external face of the test specimen was exposed to a series of positive/negative test pressures of ± 600 Pa (intervals of 30 seconds, 20 cycles). The movements and deformations of the window were reversible; no permanent deformations or visible changes occurred.

4.3 Final test

4.3.1 Deformation of the window in the final condition following application of a 500 N load on the edge of the casement as per DIN 18055.

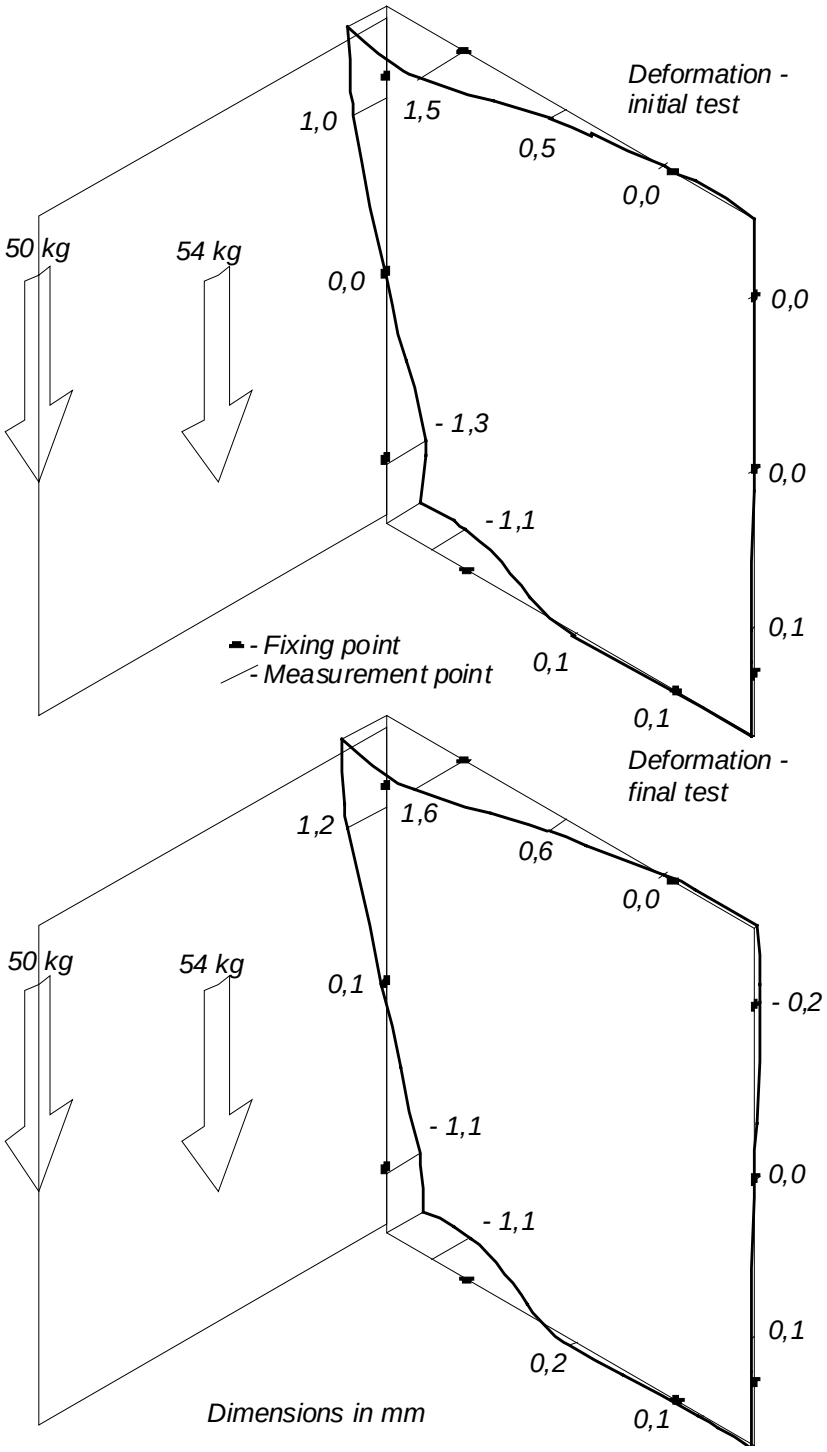

Fig. 10 Deformation of the frame with opened casement under exposure to 50 kg additional weight (static condition) - initial and final test

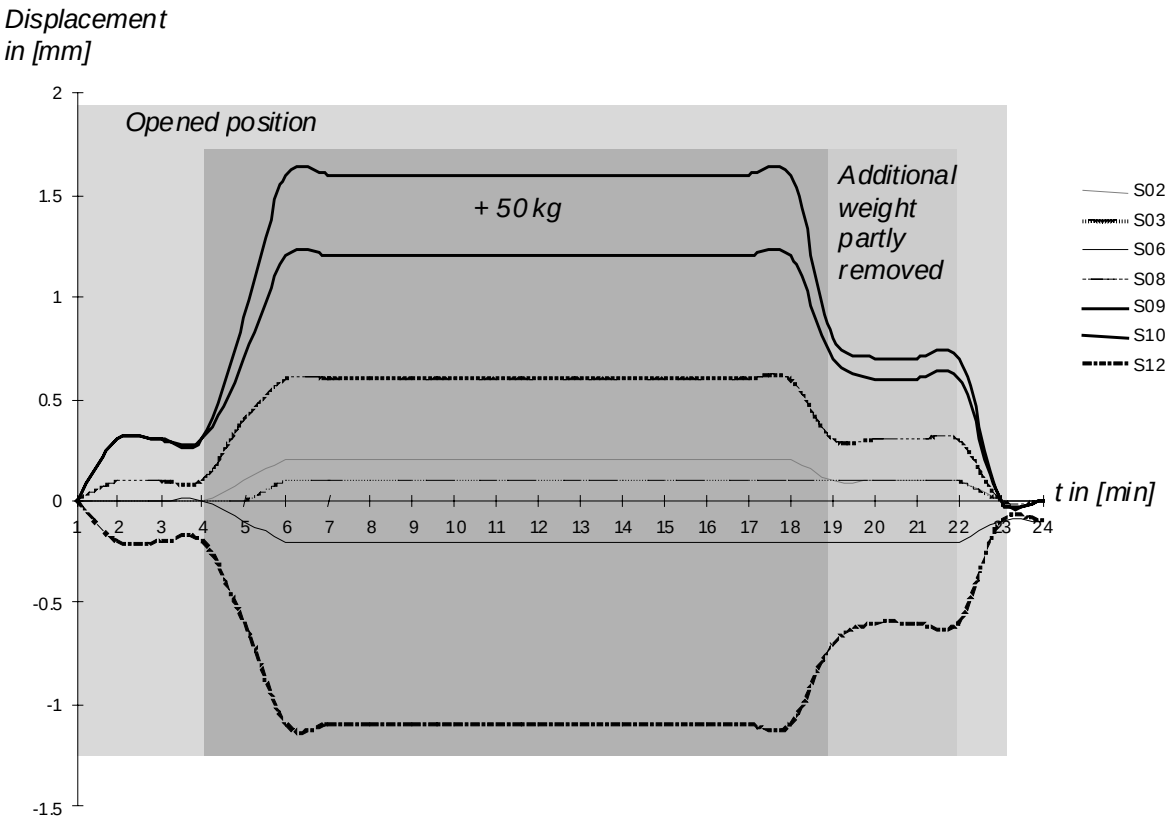

Fig. 11 Curve of displacements of measurement points S02, S03, S06, S08, S09, S10 and S 12

4.3.2 Testing of operating forces

The casement was initially stiff but could be adjusted using the adjustment facility of the hardware. The handle could be operated; the window could be opened and tilted. The operating forces of 6 Nm lay below the 10 Nm permitted by the quality regulations and test specifications of the RAL Quality Assurance Association for Windows and External Pedestrian Doors.

4.3.3 Application of positive/negative test pressures (static) as per prEN 12211

Fig. 12 shows the deformation of the frame under exposure to a static negative wind pressure of 600 Pa.

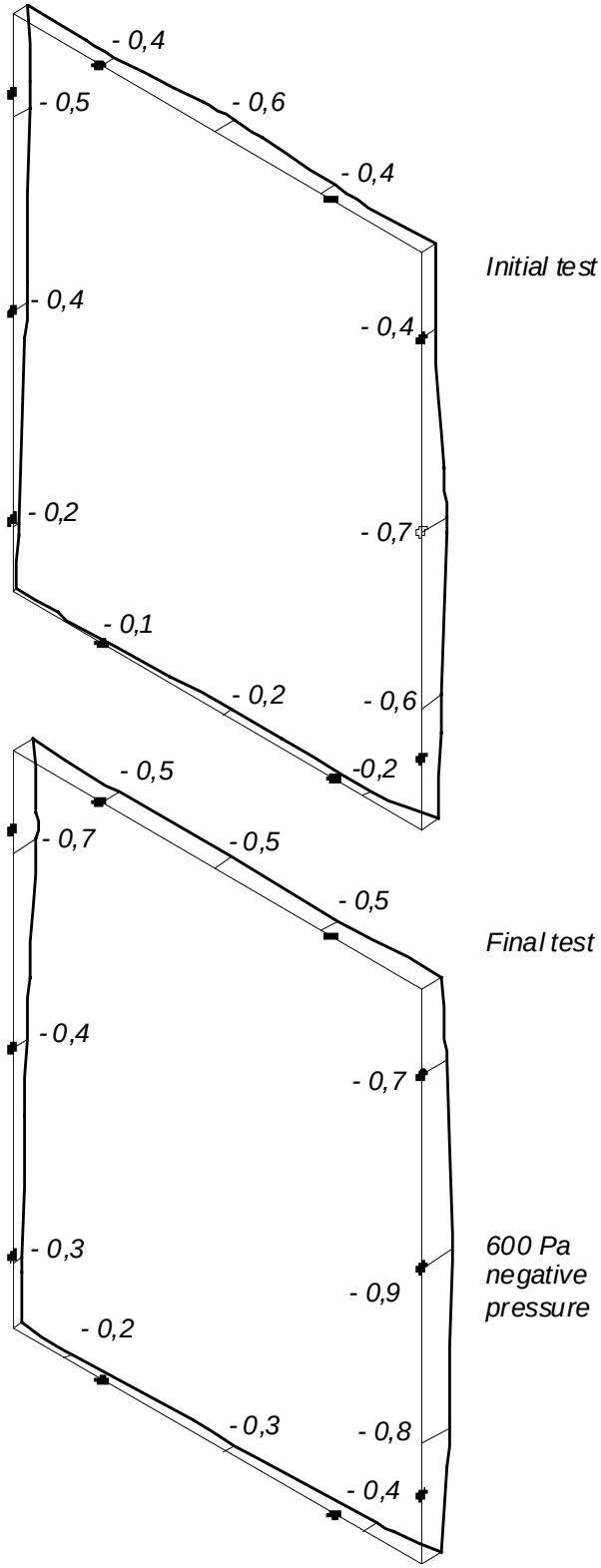

Fig. 12 Deformation of the frame under negative wind pressure

Fig. 13 shows the deformation of the frame under exposure to a static positive wind pressure of 600 Pa.

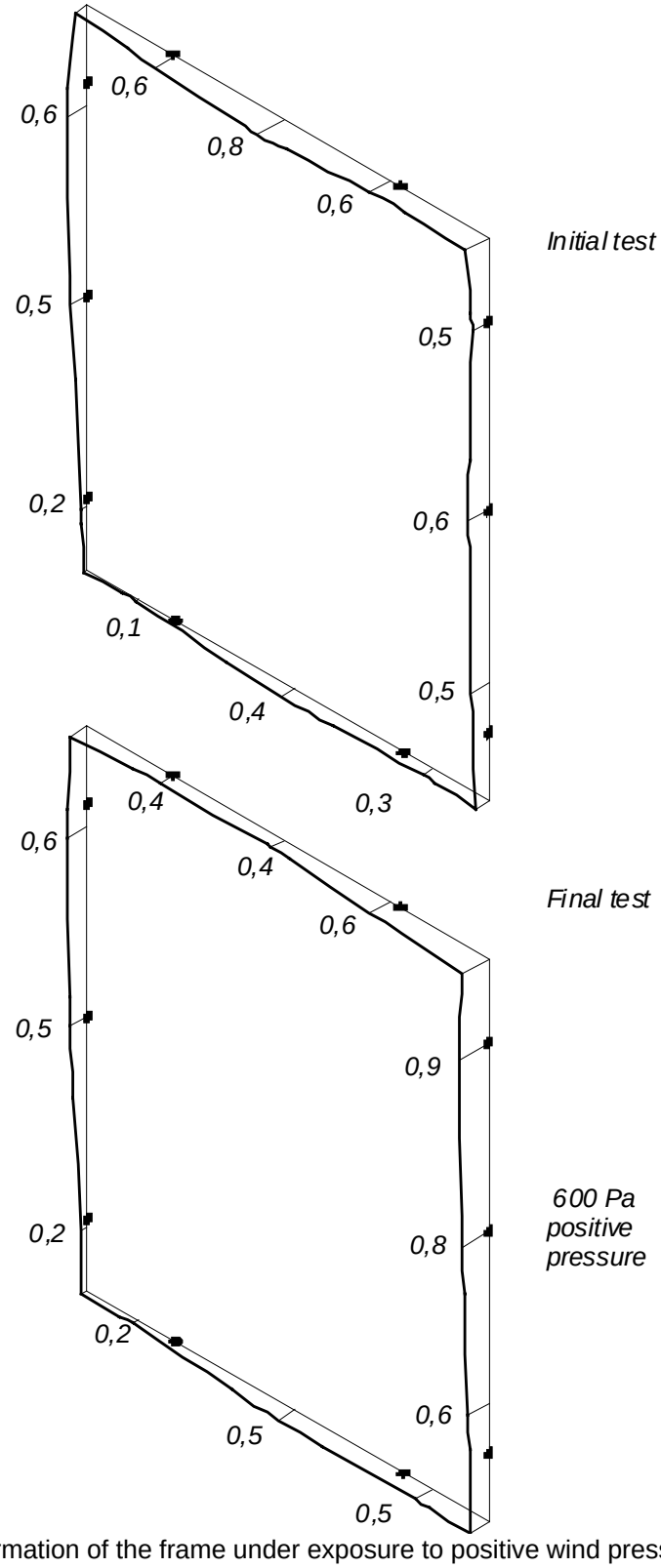

Fig. 13 Deformation of the frame under exposure to positive wind pressure

4.3.4 Safety test as per prEN 12211

The safety test was performed at the end of the tests by application of a pressure of approx. 1200 Pa. Following loading, no changes that could cause functional impairment were noted.

4.3.5 Evaluation by visual inspection of the position and arrangement of the fasteners in the window and towards the wall in comparison with the initial test

Following completion of the tests, the test specimen was subjected to a visual inspection. No changes to the fixing points were visible from the outside.

The window was dismounted and the screws were found to be holding firmly. Due to the bearing pressure, slight expansions of the screw holes in the window could be determined (Fig. 14). These expansions occurred in the lower plastic bar, due to the absence of a metal wall in this area (Fig. 15).

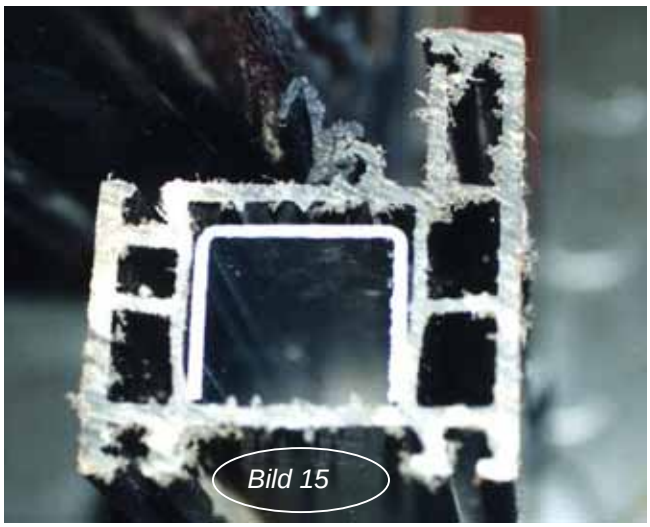

Fig. 14 Section of the window profile

Fig. 15 Screw hole B5

5 Analysis and statement

A component test was performed to test the performance of the SPAX frame anchor manufactured by Altenloh, Brinck & Co., 58256 Ennepetal, Germany, for fixing plastic windows. The component test comprised exposure to climatic and mechanical loads, in order to apply a load to the installed fasteners similar to that applied in practical application. On the basis of the applicable standards, the following loads were applied:

- A series of positive/negative test pressures of ± 600 Pa as per prEN 12211
- Application of a 50 kg additional load to the opened casement as per DIN 18055
- 20 extreme thermal cycles (outdoor climate in winter alternating with outdoor climate in summer)
- Operating cycles - 10,000 hardware operations as per DIN 18055
- Simulation of negative wind pressure of 1200 Pa as a safety test as per prEN 12211.

The findings of this component test were as follows:

- The plastic window was held firmly by the SPAX frame anchor throughout the entire test.
- The maximum deformation of the frame perpendicular to the plane of the window was 1.6 mm, in the area of the tilt mechanism pivot.
- The maximum displacement of the frame during thermal cycling resulted in changes in the joint width of ± 1.8 mm.
- The comparison of the initial test with the final test showed displacements in the mounting area within a range of ± 0.2 mm.
- Following the safety test, no changes that could cause functional impairment were noted.
- The deformations determined in the area of the connecting joint are normal for the plastic window tested and are not negatively affected by the fixing. The deformations that occurred as a result of the simulated load neither placed excessive strain on the seal with the wall system, nor was the function of the window impaired.

In conclusion, it can be inferred from the component test that the SPAX frame anchor is suitable for the fixing of windows to brick masonry.

When installing windows, with regard to load accommodation and the distances between fasteners, reference should be made to guidelines such as the “Installation Guideline” of the RAL Quality Assurance Association for Windows and External Pedestrian Doors. With regard to insertion depths, edge distances, use of wall building materials, etc., and the professional insertion of the SPAX frame anchor, observe the processing instructions of the company Altenloh, Brinck & Co.

6 Validity of test results

The values given in this test report refer solely to the tested objects described in section 2.

7 Notes on publication of ift test reports

The rules governing the use of the test reports are set out in the attached **ift** Guidance Sheet “Guidance for the Use of **ift** Test Reports for Advertising Purposes and the Publication of their Content.”

ift Rosenheim
23 May 2007

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