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BTW nummer
004465520 B01

Report number	**08'192**
Date inspection	**09 July 2008**
Date report	**15 October 2008**
Applicant	**Blyweert/ Isonal Aluminium** Esp 440 5633 AJ EINDHOVEN
Concerns	Investigation into burglar resistance of an aluminium tilt and turn window with frame dimensions 180 x 1780 mm, made by Blyweert from the Apollo profile system (51 mm building depth)
Tester	M.F. van Dijk / R. de Graaff
Inspector	J.M. van Diggelen
Conclusion	The tested façade element satisfies the requirement for burglar resistance of class 2 for tests and assessment of burglar-resistant façade elements with doors, windows, shutters and fixed fillings in accordance with the following standards - NEN 5096/A1: 2002 - ENV 1627: 1999

CONTENTS

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1 INTRODUCTION

1.1 Purpose of the investigation

SKG instructed Blyweert/ Isonal Aluminium based in Eindhoven to conduct burglar-resistant tests on a tilt and turn window with the aim of testing this façade element against the applicable standards for testing and assessing burglar-resistant frames, windows and doors.

1.2 Conclusion of the investigation

The element satisfies the total classification 2 in accordance with NEN 5096 and therefore automatically satisfies class 2 of ENV 1627.

Class 2

1.3 Declaration of conformity

Apart from what is stated in Chapter 4, conformity is not applicable for this element.

1.4 Reproduction of SKG reports

Drawn up at Wageningen on 15 October 2008

J.M. van Diggelen
Sector Manager

1.5 Accountability and method

General:

The investigation and report are based on the Dutch standard for testing and assessing burglar-resistant façade elements with doors, windows, shutters and fixed fillings NEN 5096/A1 2002.

Test in general:

- The test requires 2 identical elements.
- See for the testing facility NEN 5096 drawing section 1.7.
- During the tests, the test element is placed in the test facility with the attack side forward, unless stated otherwise.
- Prior to the test, the elements are assessed on normal functioning, after which the client is given the opportunity to make adjustments on site or to release the elements.
- The locking points and panel sections of the elements are marked and the perimeter play is determined.
- On the first element, the static, dynamic and the manual preliminary test are carried out. By means of the static and dynamic test under laboratory conditions, the properties of the test element are determined.
- The divergences as a result of the exerted pressure forces of the movable part with respect to the fixed part and of the panel filling in the mounting with respect to the movable part are statically determined. For the points of application see Tables 7, 8 and 9;
- The points of application for the dynamic test are specified in Table 10, section 5.2;
- The sole purpose of the manual preliminary test is to determine the weak spots of the test element, on the basis of which an attack plan is formulated for the manual main test. During the manual preliminary test, all attack points of the element are attacked during a time dependent on the class, followed by forcing of a passage regardless of the time needed for that.
- The main test is carried out on the second element.

1.6 Classification of resistance classes

"Class designation" KOMO certificate [1])	Static	Dynamic	Manual	Tool set
1	1	1	1	none
2	2	2	2	A
façade 3	3	3	3	B
4	4	4	4	C
5	5	5	5	D
6	6	6	6	E

Table 1

1) If this report is used in applying for a KOMO certificate for burglar-resistant façade elements, the following designations apply:

Informative description of manual test in accordance with NEN 5096, appendix D:

1 resistant to burglar with tools;
2 resistant to burglar with simple tools;
3 resistant to burglar with simple tools, including a crowbar;
4 resistant to experienced burglar with an extensive tool set including battery powered equipment;
5 resistant to experienced burglar with extensive tool set including electrical equipment such as a grinding machine with a cutting disc of max. 125 mm, etc.00;
6 resistant to experienced burglar with extensive tool set including electrical equipment such as a cutting machine with a cutting disc of max. 230 mm, etc.

1.7 List of tool sets

Tool sets A, B and C, and generally additional equipment for all classes in accordance with NEN 5096.

Set A:

1 screwdriver	l=375 mm, w=16 mm	l= length total, incl. handle
1 screwdriver	l=260 mm, w=10 mm	
1 pipe wrench	l=240 mm	
1 adjustable joint pliers	l=240 mm	
Wooden wedges	l=200 mm, w=80 mm, h=40 mm, (angle 9 to 10°) (oak or beech)	

Set B	Set A plus:	
1 adjustable joint pliers	l=500 mm	
1 screwdriver	l=375 mm, w=16 mm	
Set C	Set B plus:	
1 hammer 1.25 kg	l=300 mm	1 minisaw
1 chisel	l=250 mm, w=30 mm	1 metal saw 300 mm
1 cold chisel	l=350 mm, w=30 mm	1 drilling machine 320 W power consumption
1 axe	l=350 mm	1 drill set HSS, max. 10 mm
1 bolt cutter	l=460 mm	2 tin cutters (left/right)
1 adjustable joint pliers	l=710 mm (instead of adjustable joint pliers l=500 mm)	

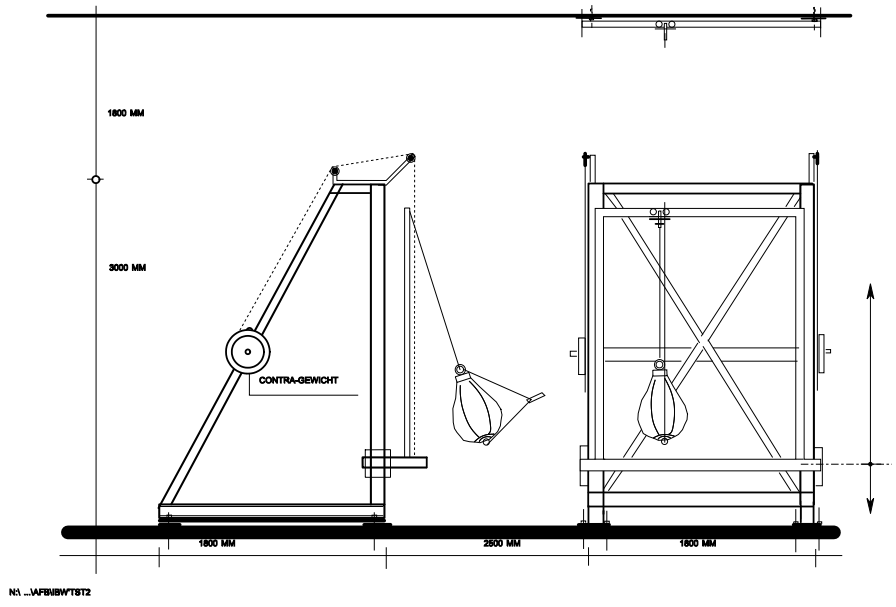
General additional equipment:

1 set small screwdrivers	lmax=220 mm, wmax=6 mm	1 torch
1 set varioius socket wrenches	lmax=180 mm	1 set wire hooks
1 set Allen keys	lmax=120 mm	metal wire
1 set drevels		1 cord
1 hammer	200 gram	1 role adhesive tape
1 tongs	lmax=200 mm	1 overalls
1 tweezers		1 pair work gloves
1 knife	lemmet max=120 mm	1 safety goggles
1 bahco	10"	1 steel universal key

Equipment for testing via "drilling holes":

1 drill set HSS, max. 10 mm	1 speed drill set, max. 16 mm
1 battery drilling machine	(pieces (bent) metal wired max. Ø 4 mm

1.8 Test facility



2. REQUIREMENTS

2.1 Requirements belonging to the resistance classes:

Requirements static tests:	The max. bending outwards of the movable part with respect to the frame as a result of an applied load in accordance with the table below may not be exceeded.			
Classification	Filling corners Guide mechanism [5]) Guide rail [5]) F1 in kN / $F_{1,1}$ in kN [5])	Between locking points [1]) Between guides [5]) Roller guides [5]) F2 in kN	Locking points Pull-up resistance [5]) F3 in kN	Weakest point P4 [4])
	max. bending outwards [2]) pressure point with respect to mounting or attack in (mm or °)	max. bending outwards [2]) with respect to attack in (mm)	max. bending outwards [2]) pressure point with respect to attack in (mm)	max. bending outwards [2]) pressure point with respect to attack in (mm or °)
1 / 2	3 8 / (10 or 30° [5])	1,5 30 / (10 [5])	3 / (6 [3]) 10 / (50 [5])	30 / (50 or 30° [5])
3	6 8 / (10 or 30° [5])	3 20 / (10 [5])	6 10 / (50 [5])	20 / (50 or 30° [5])
4	10 8 / (10 or 30° [5])	6 10	10 10 / (50 [5])	10 / (50 or 30° [5])
5 / 6	15 8 / (10 or 30° [5])	10 10	15 10 / (50 [5])	10 / (50 or 30° [5])

Table 2

[1]) Only insofar as centre to centre distance is > 400 mm.

[2]) The bending outwards is measured after the locking points are in contact by exerting a load of 0.3 kN.
The maximum bending outwards may amount to 2 mm at the specified load.

[3]) When the element is implemented with only 1 lock or locking point (not applicable for rolling elements).

[4]) P4 is the weakest point, that is to say the point at an arbitrary location where the largest bending outwards as a result of the load applied at the site of the locking points (F3) or between them (F2).

[5]) Only applicable for rolling elements.

Requirements dynamic test:

As a result of this test the moving part may not be so heavily damaged or deformed that a passage can be realised without appreciable resistance. Attachments of plane fillings must still be functional.

Classification	Height of fall
1	800 mm
2	800 mm
3	1200 mm

Table 3

Requirements for the manual main test:

The general criterion is that that no opening may occur that offers sufficient passage.

Passage: Block of 150 x 250 x 250 mm.

Manual class	Max. contact time	Max. Total test time (minutes)	Tool set see section 1.6
1	n/a	n/a	None
2	3	15	A
3	5	20	B
4	10	30	C
5	15	40	D
6	20	50	E

Table 4

2.2 Constructive requirements belonging to the resistance classes

2.2.1 General
- The element should satisfy the current standards with respect to façade elements.
- The assessment of the requirements specified here with respect to the construction is a responsibility of the inspection institute.

2.2.2. Hinges and locks
- At least one bolt of movable glazed doors and windows of adjoining glazed elements where no burglar-resistant glass of at least class 2 in accordance with NEN-EN 356 Is applied, must be closable. If burglar-resistant glass of at least class 2 in accordance with NEN-EN 356 is applied, the requirement of lockability is cancelled.
- Hinges and locks where the attachments are visible and/or accessible for disassembly must be fastened with at least 2 one-way screws.

Resistance class in accordance with NEN 5096	1/ 2	3	4
Cylinders	*	**	***
Fittings	* [1])	**	***

Table 5

[1]) Classification in accordance with BRL 3104, which is heavier than the class ** in accordance with the 2nd design NEN 5089.

Resistance class in accordance with ENV 1627		2	3	4
EN 1303 - Cylinders				
Key-related protection	digit 7	4	4	6
Attack-related protection	digit 8	1 [2])	1	2
EN 1906 - Fittings	digit 7	1	3	4
EN 12209 - Locks	digit 7	3	5	7

Table 6

) The pulling protection of the cylinder may be realised both by the cylinder itself and the fittings.

2.2.3 Plane fillings disassembled;

- On the burglary side, the filling may not be capable of being
- The plane filling of the materials other than glass should also satisfy resistance class 2.
- The plane filling of glass should satisfy what is stated in Table 6.

Resistance class in accordance with NEN 5096	Resistance of glazing in accordance with NEN EN 356
2	2 or insulating glass

Resistance class in accordance with ENV 1627	Resistance of glazing in accordance with NEN EN 356
2	4

Table 7

2.2.4 Installation:

- The façade elements should be integrated in accordance with the guidelines of the manufacturer and the current installation instructions.

3. VERIFICATION OF CONSTRUCTIVE REQUIREMENTS

Observation: no details

4. Conformity

4.1 When tested and approved elements are provided with extra locking points, etc. they can be declared of equal quality insofar as these additions do not negatively affect the degree of burglar resistance.

Example: an element provided with 1 locking point bears the test. A further identical design provided with extra locking points is then at least of equal quality.

4.2 Hinges and locks of tested elements are exchangeable against at least equivalent hinges and locks. That is to say that only hinges and locks may be replaced by certified hinges and locks of a similar class when determined by visual assessment that these substitute hinges and locks function at least identically in terms of burglar resistance.

4.3 The results of the tests of frames with different main dimensions (length/width) than the tested sample are transferable, subject to the restrictions referred to in Appendix C of NEN 5096.

This means among other things:

- The main dimensions A B, C and D (see figures C1 - C4) may vary in a positive way to (+20%).
- The dimension E (see figures C3 and C4) may in a positive sense vary to (+10%).
- If smaller elements are implemented with an equal number of closing points, it is assumed that these elements have the same burglar resistance as the tested sample.
- Windows or doors with composite fittings may become indefinitely larger (solely from the perspective of burglar resistance) providing the closing points that are added do not exceed the dimensions E and B.

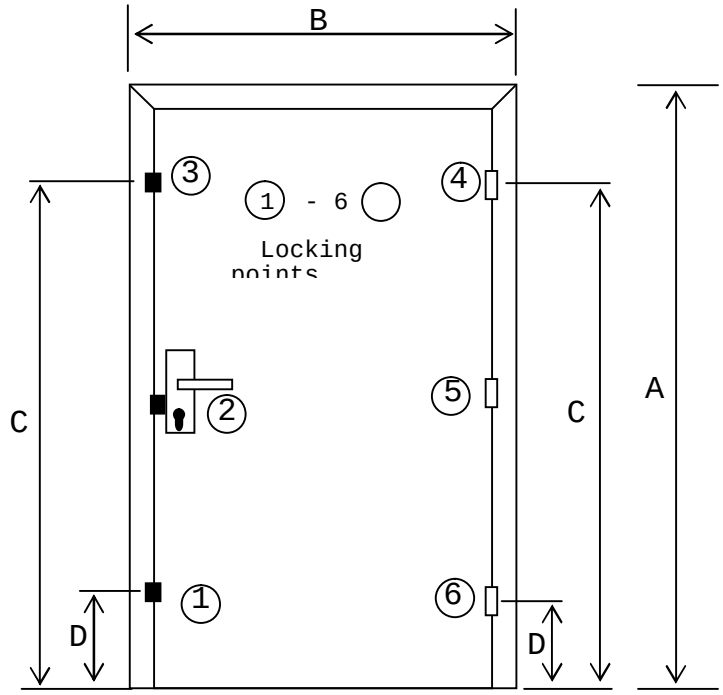


fig. C1

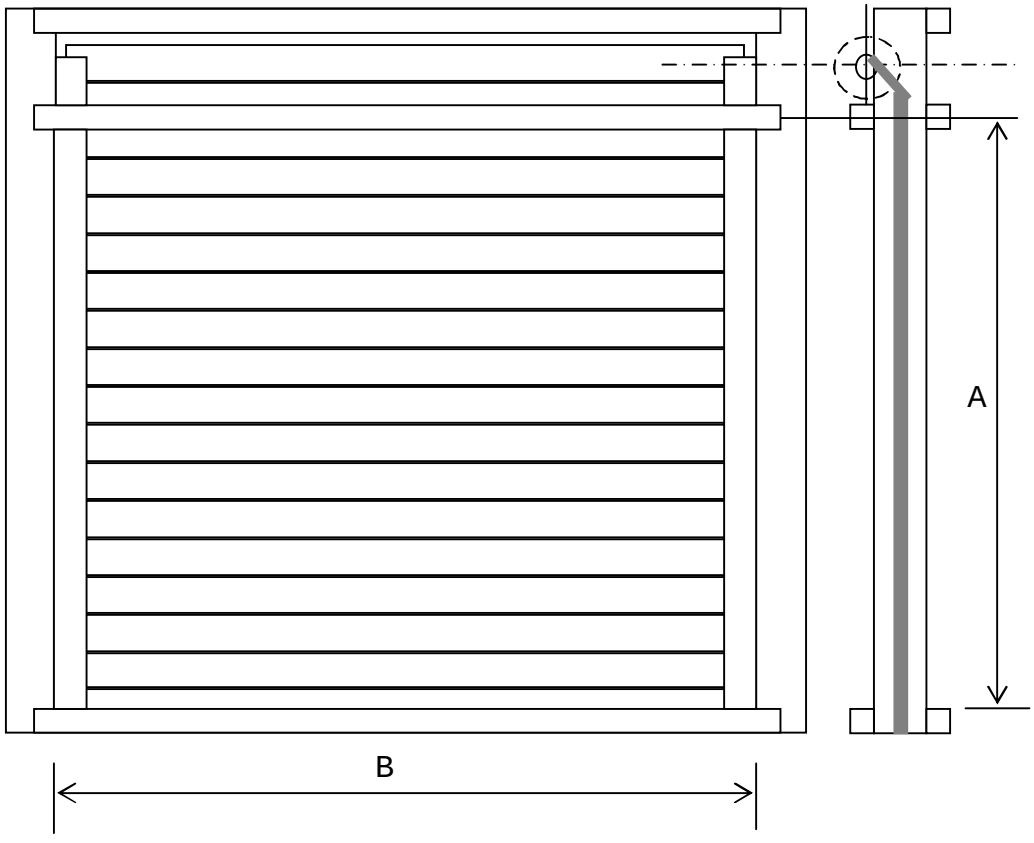


fig. C2

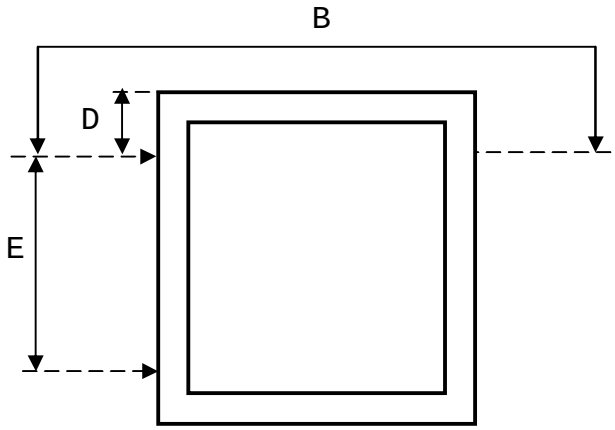


fig. C3

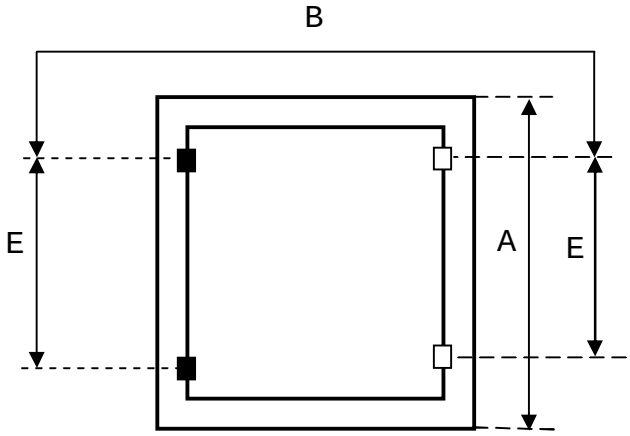


fig. C4

4.4 Further conditions when using certified hinges and locks:

- When using certified hinges and locks the accompanying installation instructions should be consulted.
- When using certified composite fittings the main dimensions of the façade elements (tilt and turn windows, etc.) may be chosen in accordance with the installation instructions of the fittings concerned. Here the restriction mentioned earlier concerning the varying of the main dimensions may be ignored.

4.5 For burglar-resistant elements additional restrictions may be added.

4.6 If burglar-resistant elements are requested that do not fall within the permissible deviations specified, the assessment of an independent third party is required.

5 TESTS

5.1 Static test

Requirement: Bending out max. 8 mm at the corners of the panel filling, max. 10 mm at the locking points and max. 30 mm between the locking points.

Observation: In the tables below (8, 9 and 10) the test results are mentioned (in the picture in section 6 the positions of the locking points and section marking are indicated).

1a) bending out ≤ 8 mm

Filling corners	Bending out in mm **F1**/ 3 kN
V4	2.8
V5	2.6

Table 8

1b) bending out ≤ 10 mm.

Locking points	Bending out in mm **F3** 3 kN
S1	2.5
S2	2.0
S3	2.7
S4	2.2

Table 9

1c) bending out ≤ 30 mm.

Between locking point	Bending out in mm **F2** 1,5 kN
S1-S2	2.3
S1-S4	2.2

Table 10

Conclusion: The element satisfies the specified requirement, class 2, with respect to the static test.

5.2 Dynamic test

Requirement: No passage may occur.

Observation: In the table below the test results are specified (in the picture in section 6 the positions of the places where the falling mass struck the element is indicated).

Place	Number	Changes
V.1	3	None
V.2	1	None
V.3	1	None
V.4	1	None
V.5	1	None

Table 11

Comment: After the sand bag test penetration was impossible.

Conclusion: The element satisfies the specified requirement, class 2, with respect to the dynamic test.

5.3 Manual tests

5.3.1 Preliminary test

Application points: The following relevant application points have been determined with respect to this element.

- Locking points all around.
- The coupling (carrier) between the handle and the drive shafts.
- Coupling parts of the multipoint lock.
- The mounting of the plane filling.

The course of the 1st phase of the manual preliminary test (min. 45 seconds per application point) was as follows:

- The locking points (S1/2/3/4) each remained fully intact for more than 45 sec. after the attack.
- The coupling (carrier) between the handle and the drive shaft remained entirely intact after an attack of more than 1 minute.
- During various attacks, each for more than 45 sec., we did not affect the coupling parts of the multipoint lock.
- The folding a piece of glass rebate flange over a total of 80 cm took 1 minute.
- During an attack of well over 1 minute, we did not succeed in forcing out a vertical glass frame.

By means of further manual tests a passage was forced (2nd phase).

5.3.2 Main test

Requirement: Contact time 3 minutes, penetration impossible within 15 minutes.

Course of test: On the basis of the course of the preliminary manual test no main test was performed.

Conclusion: The element satisfies the specified requirement, class 2, with respect to the manual test.

6 TECHNICAL SPECIFICATIONS TEST ELEMENT

The aluminium façade element consists of a tilt and turn window in a frame. The unit is mounted in a wooden adjusting frame. Frame dimensions 1180 x 1780 mm.

The window dimensions are approx. 1070 x 1670 mm (FFW x FFH).

System	:	Blyweert Apollo (51 mm)
Frame	:	L profile: P-01-101
Widows	:	Z profile: P-01-201
Glass frames	:	Profile: 6114
Panel	:	21 mm multiplex
Sealings	:	EPDM: Glazing exterior A-GS-100, interior A-GS-303, rabbet sealing interior A-GS-131, central sealing A-GS-130.
Anchoring	:	Attachment with stainless steel screws filled with filler plates
Glass installation.	:	▲ support/O wedge blocks, approx. 200 mm from corners
Spacer plates	:	O1 and O3 Sobinco clampable type 30340-630-1, O2 Sobinco clampable type 30340-631-1. The spacer plates are each mounted in the fixation plates with 2 screws M5 x 6 and in the 1st frame profile wall with 1 (self-drilling and tapering) screw 4.2 x 25
Unhingement protection:		U1 Sobinco clampable type 30340-631-1. This unhingement block is mounted in the fixation plate with 2 screws M5 x 12 and in the 1st frame profile wall with 1 (self-drilling and tapering) screw 4.2 x 25
Locks	:	A Sobinco multipoint lock with type designation Chrono Safe, certificate no. 417.471.02. This multipoint lock is designed with 4 mushroom cams (S1/2/3/4). The clampable locking plates (for S1/2/3/4) are each mounted with 3 screws M5 x 6 in the fixation plates and with 1 (self-drilling and tapering) screw 4.1 x 15 in the 1st frame profile wall.
Handle	:	A Sobinco handle lockable with a key, type no. 30300-659CYL.
Carrier	:	The protected carrier (connection between handle and drive shafts of the locking system), type no. 30300-700-1, is inserted in the Nut of the window profile, attached to the drive rods with 2 wedge blocks, type no. 30300-700-2, which are clamped in the carrier and each secured with an adjusting screw M5.

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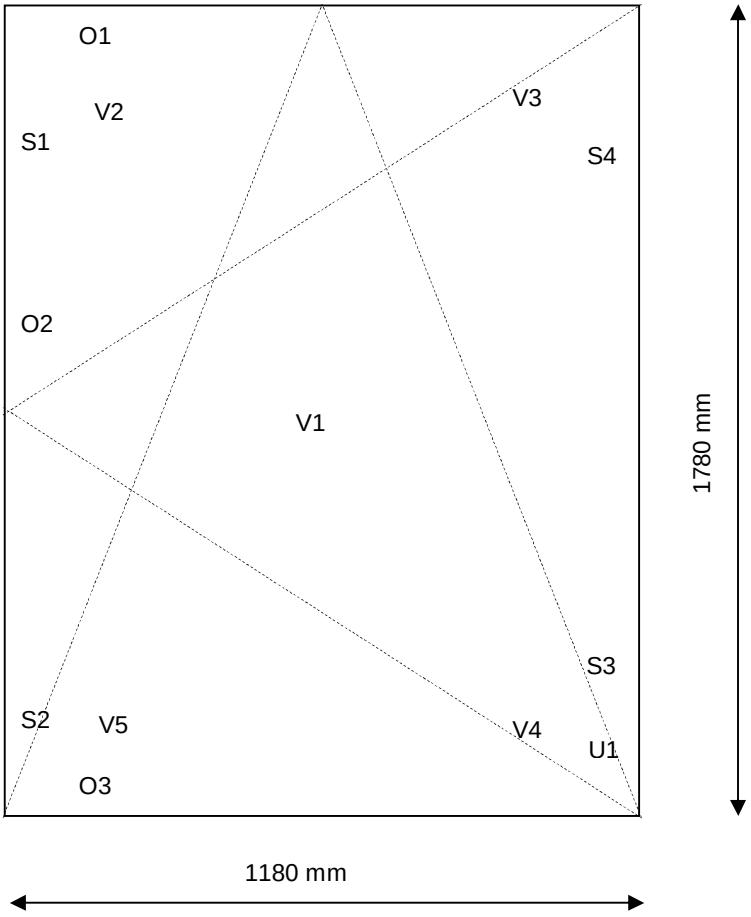
6 Technical specifications test element (cont.)

Exterior view



7. **Appendix(ices): drawing(s)**

SKG item no.	Drawing	Sheet	Date
1	View		15-07-2008
2	Vertical cross-section		15-07-2008
3	Overview locking system	BS Chrono Safe; BS p93	26-09-2008