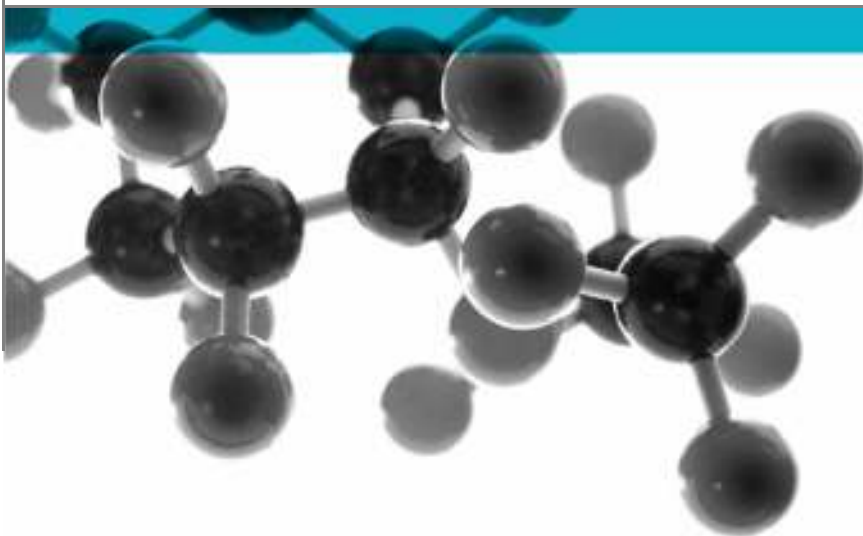




# BS 6375-2:2009



**Test of: Ali Vu Top Hung Casement Window**

**Performance of windows & doors - Part 2: Operation & strength**

A Report To:  
Senior Architectural Systems  
Eland Road, Denaby Main, Doncaster, DN12 4HA

Document Reference:  
WIL 388464

Date: 28/02/2018

Copy: 1

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Page 1

Testing  
Advising  
Assuring



## TEST CONCLUSIONS

Samples of:  
 Manufacturer Senior Architectural Systems  
 Product Window  
 Model Ali Vu Top Hung Casement

have been tested in accordance with: BS6375-2:2009  
 By Exova (UK) Ltd, a UKAS accredited Testing Laboratory (No. 0621)

At Unit 3 Wednesbury One, Black Country New Road, Wednesbury, WS10 7NZ.  
 Results and comments as detailed below:

Clause No.	Description	Compliance
5.1	Operating forces – Class 1	Yes
5.2	Mechanical strength – Class 3	Yes
5.2.1	Static torsion – Class 3	Yes
5.2.2	Racking – Class 3	Yes
5.3	Load bearing capacity of safety devices – 350N	N/A
5.4	Impact resistance – Class 0	Yes
5.5	Resistance to repeated opening and closing – Class 2	Yes

No inferences can be made regarding performance against other requirements of this standard

Tests marked “N/A” are not applicable to the sample under test.  
 Tests marked “N/T” were not applied to the sample under test

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 Systems



## AUTHORISATION

Tests performed by: Chris Bryan, Senior Test Engineer  
 Josh Ratcliffe, Trainee Test Engineer  
 Simon Lewis, Trainee Test Engineer

Report issued by: Mark West, Door & Window Laboratory Manager

Signed



Date 27<sup>th</sup> February 2018

For and on behalf of Exova (UK) Ltd

Report authorised by: Chris Bryan, Senior Test Engineer

Signed



Date 27<sup>th</sup> February 2018

For and on behalf of Exova (UK) Ltd

Report issued: 28 February 2018



**NOTE.**

Tests marked "Not UKAS Accredited" are not covered by the Laboratory UKAS accreditation schedule.

Tests marked NT were not tested

Tests marked NA are not applicable to the product on test.

The laboratory has tested the product supplied by the client as sampled in accordance with their own requirements

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## TEST DETAILS

### CLIENT DETAILS

Company name Senior Architectural Systems  
 Address Eland Road  
 Denaby Main  
 Doncaster, DN12 4HA

Contact Tom Grant

### ORDER DETAILS

Order number 4100  
 Dated 30/08/2017

### SAMPLE DETAILS

Outer frame 1603 x 1603 x 68mm  
 Opening casements 1570 x 1570 x 68mm  
 Configuration Single top hung casement open-out  
 Material Aluminum  
 Details of Hardware  
 Hinges 2no. Senior Architectural top hung hinge SPW7HS24  
 Hinge protection 2no. pairs Senior Architectural hinge protector HCMA353309SC  
 Lock Senior Architectural espag locking SPWE7LH  
 Handles Senior Architectural window handle INLINEB & SPIN9MM  
 Seals SP2400, SP2356, SP7146  
 Glazing details Double glazed

### TEST DETAILS

Test specification BS 6375-2:2009  
 Full test Yes  
 Test to clauses All  
 Test methods BS EN 12046-1:2003 operating forces  
 BS EN 14609:2004 static torsion  
 BS EN 14608:2004 racking  
 BS EN 13049:2003 soft body impact  
 BS EN 14609:2004 strength of safety devices  
 BS EN 1191:2012 Annex G repeated opening

Sample received 10/10/2017  
 Test started 12/10/2017  
 Test completed 08/11/2017

Special Test requirements  
 Other reports to be used in conjunction with this report

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## TEST PROCEDURE

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<b>Introduction</b>	<p>This test report should be read in conjunction with the Standard BS 6375-2:2009 Performance of windows and doors – Part 2: Classification for operation and strength characteristics and guidance on selection &amp; specification</p> <p>The specimens were judged on their ability to comply with the performance criteria as required in BS 6375-2:2009, with test methods BS EN 12046-1:2003, BS EN 14609:2004, BS EN 14608:2004, BS EN 13049:2003, &amp; BS EN 1191:2012 Annex G, classified in accordance with BS6375-2:2009, BS EN 131145:2001 &amp; BS EN 12400:2002.</p>
<b>Instruction To Test</b>	<p>Initial requirement was as defined in BS6375-2, requiring a performance of Class 1 for operating forces, Class 3 for mechanical strength, a threshold value of 350N for load-bearing capacity of safety devices, Class 0 for impact resistance, and Class 2 for repeated opening and closing.</p>
<b>Test Specimen Construction</b>	<p>A description of the test construction is given in the Schedule of Components. The description is based on a detailed survey of the specimens and information supplied by the sponsor of the test.</p>
<b>Installation</b>	<p>The window was supplied mounted within a timber/aluminium sub-frame of nominal section 75 x 100mm fitted flush with the exterior face, in accordance with the clients fitting instructions.</p>
<b>Sampling</b>	<p>The samples were not independently witnessed or selected and were provided direct from the test sponsor.</p>
<b>Test Climate</b>	<p>The sample was conditioned in the laboratory in the range 15-30 °C and 25-75% humidity.</p> <p>The temperature and humidity in the lab was maintained in the range 16.4-21.4°C and 42.1-63.4% humidity for the duration of the test.</p>

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## INITIAL OBSERVATIONS

**The internal face of the sample**



**Sample handle**



**Sample hinge**



**Sample keeps**



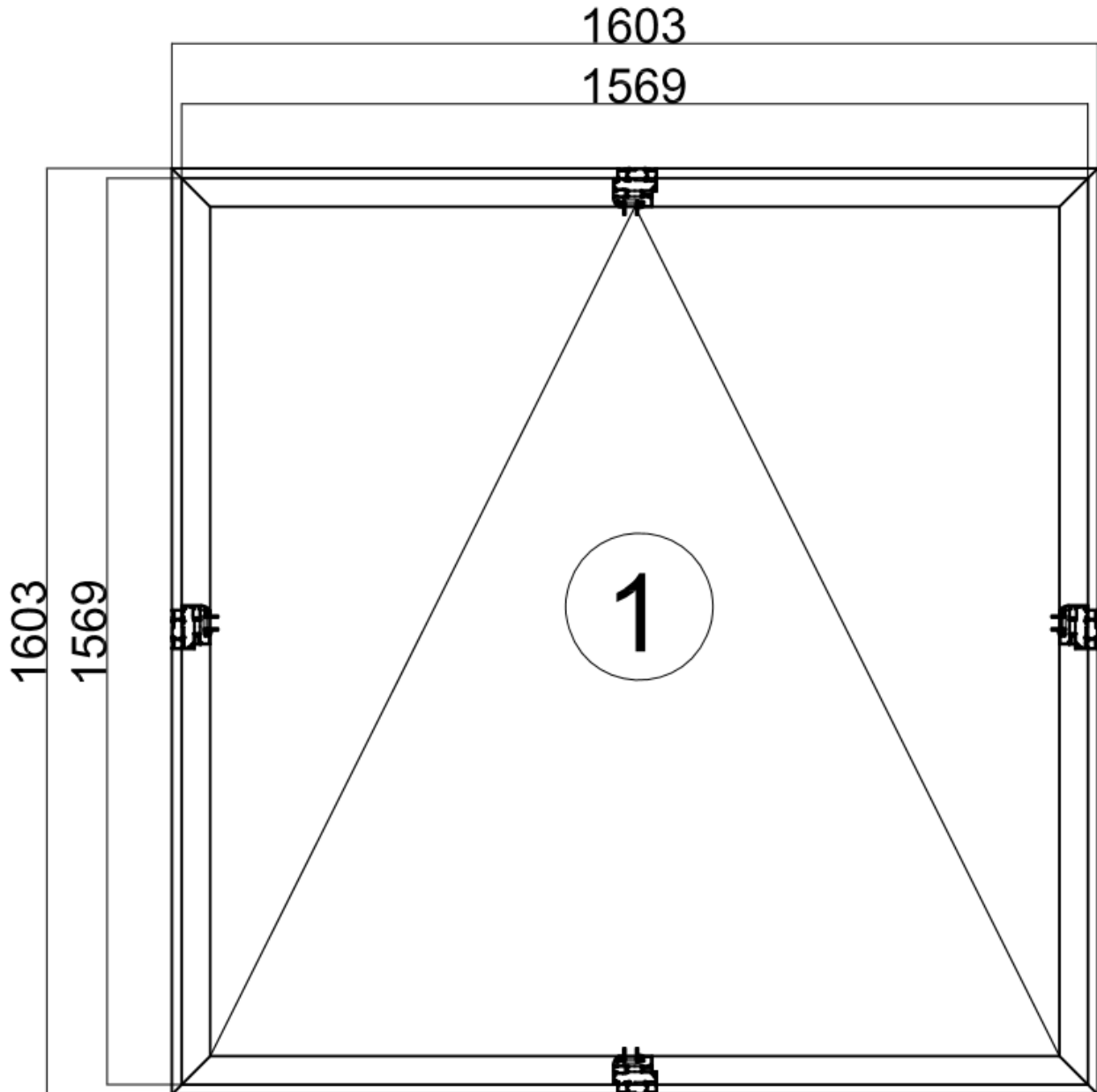


**Sample locking  
cams**



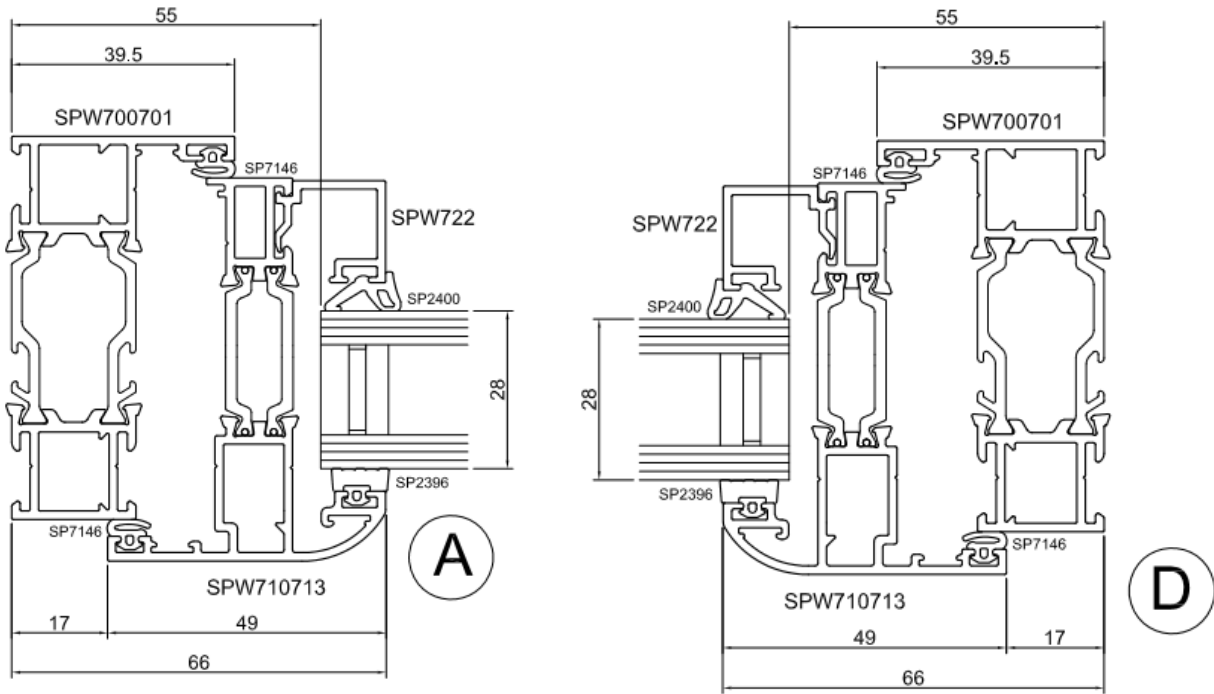
## TEST SPECIMEN

Figure 1- General Elevation of Test Specimen (External Face)



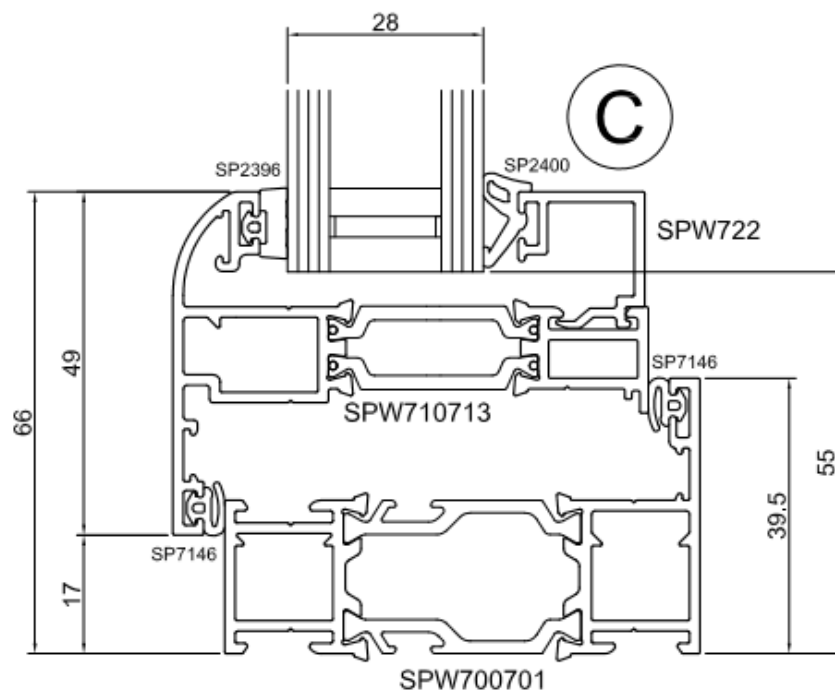
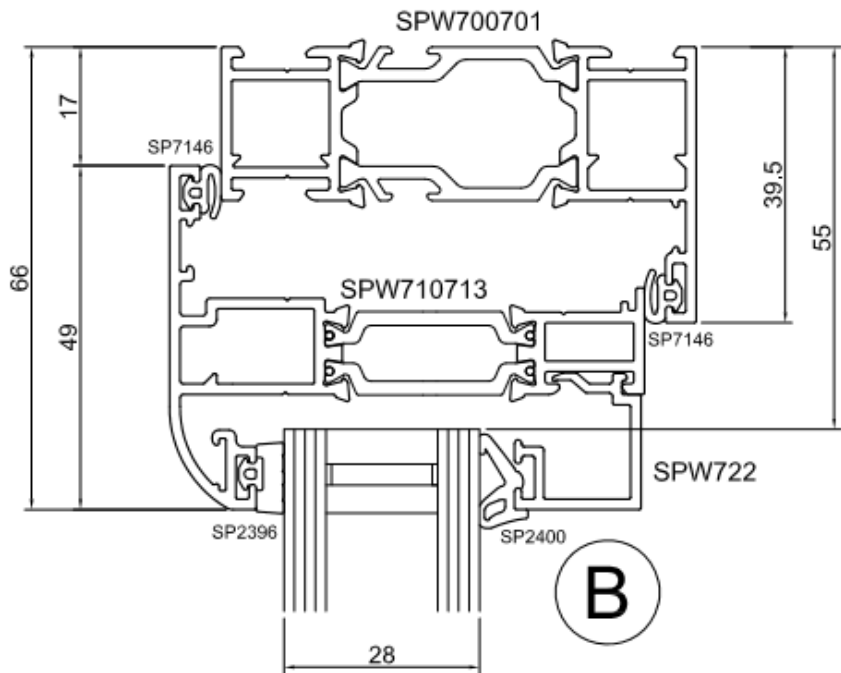
Do not scale. All dimensions are in mm

Figure 2 – Horizontal section



Do not scale. All dimensions are in mm

**Figure 3 – Vertical section**



Do not scale. All dimensions are in mm

## SCHEDULE OF COMPONENTS

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(Refer to Figures 1 to 3)  
 (All values are nominal unless stated otherwise)  
 (All other details are as stated by the sponsor)

### Variants

None

<u>Item</u>	<u>Description</u>
<b>1. Window frame</b>	
Supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
Profile code	: SPW700701
Material	: Aluminium
Grade	: 6063 T6
Gauge / wall thickness	: 1.5mm
Thermal break material / method	: Polyamide
Thermal break size	: 34mm
Glazing / casement rebate size	: 17.5mm
Section size	: 68 x 39.5mm
Fixing jamb to head joints	
i. type	: Crimped Cleat      SPW760CT14
ii. size	: 62 x 62mm
iii. quantity	: 2 No. per Joint
Details of adhesive	
i. supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
ii. reference	: 3COS0073 Cosmopur 819
<b>2. Window frame weather seals outer</b>	
Supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
Reference	: SP7146
Material	: EPDM
Fixing method	: Push Fit
<b>3. Window frame weather seals Inner</b>	
Supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
Reference	: SP7146
Material	: EPDM
Fixing method	: Push Fit

<u>Item</u>	<u>Description</u>
<b>4. Window casement (s)</b>	
Overall Size	: 1569 x 1569mm
Supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
Profile codes	: SPW710713
Material	: Aluminium
Grade	: 6063 T6
Gauge / wall thickness	: 1.5mm
Thermal break material / method	: Polyamide
Thermal break size	: 30mm
Glazing rebate size	: 16.5mm
Casement framing section size	: 68 x 49mm
Corner fixing method	:
i. type	: Crimped Cleat SPW760CT14 SPW761CT12
ii. size	: 62 x 62mm
iii. quantity	: One No. Each per Corner
Adhesive	:
i. supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
ii. reference	: 3COS0073 Cosmopur 819
<b>5. Window casement glass</b>	
Supplier	: SENIOR GLASS
Thickness / configuration	: 28mm 4/20/4
Overall size	: 1493.5 x 1493.5mm
Nominal edge clearance	: 11.5mm
<b>6. Glazing setting blocks</b>	
Supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
Material	: PVC
Thickness	: SPW7GP2 4mm SGP 28mm x 1mm 1mm
Section size	: 53 x 4 x 100mm 28 x 1 x 100mm
<b>7. Glazing gasket</b>	
Supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
Reference	: External SP2396 Internal SP2400
Fixing method	: Captive Wedge
<b>8. Glazing beads internal</b>	
Glazing method	: Internally bead
Supplier	: SENIOR ARCHITECTURAL SYSTEMS LTD
Profile code	: SPW722
Material	: Aluminium
Grade	: 6063 T6
Gauge / wall thickness	: 1.5mm
Section size	: 19.5 x 18mm
Fixing method	: Clip In

**Item****Description****9. Hinges**

Supplier	:	SENIOR ARCHITECTURAL SYSTEMS LTD
Description	:	Top Hung Friction Stay
Reference	:	SPW7HS24
Material	:	Austenitic/Ferritic Steel
Quantity	:	One No. Pair Per Vent
Fixing hinge to casement		
i. type	:	SFSF0810
ii. size	:	No.8 x 10mm
iii. quantity	:	5No. Per Hinge
Fixing hinge to frame		
i. type	:	SFSBP0810
ii. size	:	No.8 x 10mm
iii. quantity	:	4No. Per Hinge

**10. Hinge protectors**

Supplier	:	SENIOR ARCHITECTURAL SYSTEMS LTD
Description	:	Hinge protector
Reference	:	HCMA353309SC
Material	:	Metal
Quantity	:	4No. Per Window
Position	:	105mm in from the vent edge
Fixing device to casement		
i. type	:	SFSBC0809
ii. size	:	No.8 x 9.5mm
iii. quantity	:	2No. Per Hinge protector
Fixing device to frame		
i. type	:	SFSCS07
ii. size	:	No.8 x 16mm
iii. quantity	:	2No. Per Hinge protector

**11. Lock**

Supplier	:	SENIOR ARCHITECTURAL SYSTEMS LTD
Description	:	Espag Rod
Reference	:	SPW7E7LH
Material	:	Stainless Steel
Fixings		
i. type	:	SFSBC0809
ii. size	:	No.8 x 9.5mm
iii. quantity	:	10No.

**Item****Description****12. Lock Keeps**

Supplier	:	SENIOR ARCHITECTURAL SYSTEMS LTD
Description	:	Cam Keep
Reference	:	SPW7CK
Material	:	Zinc ZL5
Quantity	:	4No.
Fixing keeps to frame		
i. type	:	SFSCS07      SFSCS0819
ii. size	:	No.8 x 16mm      No.8 x 19mm
iii. quantity	:	2No. Per Keep      One No. Per Keep

**13. Lever handles**

Supplier	:	SENIOR ARCHITECTURAL SYSTEMS LTD
Description	:	Espag Handle Plus Spindle
Reference	:	INLINEB & SPIN9MM
Material	:	Metal
Fixings		
i. type	:	SFSCM0516
ii. size	:	M5 x 16mm
iii. quantity	:	2No. Per Handle

**14. Locking Wedges**

Supplier	:	SENIOR ARCHITECTURAL SYSTEMS LTD
Description	:	Locking Wedges
Reference	:	SP300121B      SPW7LWP
Material	:	PVC
Quantity	:	4No. Per Vent      2No. Per vent
Position	:	One third Of vent Width/Height from Each Edge
Fixing restrictor to casement		
i. type	:	SFSCS07
ii. size	:	No.8 x 16mm
iii. quantity	:	2No. Per Wedge
Fixing restrictor to frame		
i. type	:	SFSCS07
ii. size	:	No.8 x 16mm
iii. quantity	:	2No. Per Wedge

**15. Run-Up Blocks**

Supplier	:	SENIOR ARCHITECTURAL SYSTEMS LTD
Description	:	Run-Up Blocks
Reference	:	SPW7RB
Material	:	PVC
Quantity	:	2No. Per vent
Position	:	290mm Either Side Of Centre Of Frame
Fixing restrictor to frame		
i. type	:	SFSCS07
ii. size	:	No.8 x 16mm
iii. quantity	:	One No. Per Wedge



## PERFORMANCE CRITERIA & TEST RESULTS

Clause	Result	Pass/Fail
<b>5.1 Operating forces</b>	<p>The window was tested in accordance with EN 12046-1. The average force or torque required to disengage &amp; engage the hardware must not exceed those defined for the Class 1 of EN 13115, which requires less than 100N/10Nm for hand operated fasteners, and 50N/5Nm for finger operated fasteners. The average force required to commence and maintain motion up to 100mm must not exceed those defined for Class 1 of EN 13115, which requires a force less than 100N</p> <p>The sample met the requirements of Class 1. An average force of 49.9N was required to disengage the hardware. An average force of 14.1N was required to commence and maintain motion. An average force of 25.7N was required to close the sample. An average force of 65.73N was required to engage the hardware under a closing load of 0N.</p>	<b>PASS CLASS 1</b>
<b>5.2.1 Static torsion</b>	<p>The window was tested in accordance with EN 14609, under a load of 300N as required by Class 3 of EN 13115, with a preload of 30N. A load of 300N was applied, no damage was observed, and the window continued to operate normally. The deflection under full load was 34.67mm, and the residual deflection was 7.91mm.</p> <p>Following the test 5 manual operating cycles were carried out, and the sample met the requirements of Class 1. An average force of 45.53N was required to disengage the hardware. An average force of 21.47N was required to commence and maintain motion. An average force of 24.23N was required to close the sample. An average force of 63.53N was required to engage the hardware under a closing load of 0N.</p>	<b>PASS CLASS 3</b>
<b>5.2.2 Racking</b>	<p>The window was tested in accordance with EN 14608, under a load of 600N as required by Class 3 of EN 13115. The window was tested in accordance with EN 14608, under a load of 600N as required by Class 3 of EN 13115, with a preload of 60N. A load of 600N was applied, no damage was observed, and the window continued to operate normally. The deflection under full load was 33.52mm, and the residual deflection was 0.45mm.</p> <p>Following the test 5 manual operating cycles were carried out, and the sample met the requirements of Class 1. An average force of 60.63N was required to disengage the hardware. An average force of 9.07N was required to commence and maintain motion. An average force of 21.13N was required to close the sample. An average force of 74.8N was required to engage the hardware under a closing load of 0N.</p>	<b>PASS CLASS 3</b>

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Clause	Result	Pass/Fail
<b>5.3 Load-bearing capacity of safety devices</b>	This test was not carried out as no such device was fitted to the window.	<b>N/A</b>
<b>5.4 Impact resistance</b>	The recommended class for the UK is Class 0, no performance is required.	<b>PASS</b>
<b>5.5 Resistance to repeated opening and closing</b>	<p>Prior to the cyclic operation test, when tested in accordance with EN 12046-1, the sample met the requirements of Class 1.</p> <p>An average force of 43.9N was required to disengage the hardware. An average force of 11.93N was required to commence and maintain motion. An average force of 25.83N was required to close the sample. An average force of 61.93N was required to engage the hardware under a closing load of 0N.</p> <p>The number of cycles completed by the window was 10,000, as required by Class 2 of the standard. The stroke of the casement was 45 degrees. Observations and measurement were carried out at intervals of 25% of the total cycles. No lubrication or adjustment was specified by the client.</p> <p>No dead load was applied on the casement by the operating equipment.</p> <p>Following the cyclic operation test, when tested in accordance with EN 12046-2, the sample continued to meet the requirements of Class 1.</p> <p>An average force of 29.97N (V=-32%) was required to disengage the hardware. An average force of 16.4N (V=37%) was required to commence and maintain motion. An average force of 15.97N (V=-38%) was required to close the sample. An average force of 43.47N (V=-30%) was required to engage the hardware under a closing load of 0N.</p>	<p><b>PASS</b></p> <p><b>PASS</b> <b>CLASS 2</b></p> <p><b>PASS</b></p>

## CONCLUSIONS

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**Evaluation against objective**

The sample as provided by the client was subjected to operational & strength testing in accordance with BS 6375-2:2009 and achieved the requirements.

**Observations & comments**

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## LIMITATIONS

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**Limitations**

The results relate only to the behaviour of the specimens of the element of construction under the particular conditions of test. They are not intended to be the sole criteria for assessing the potential performance of the element in use, nor do they reflect the actual behaviour in use.

**Range of window assemblies covered by this report**

It is our opinion that the range of window assemblies covered by this report are limited to the following

- Assemblies with identical hardware fitted no further apart than in the tested assembly
- Assemblies of the same or smaller overall dimensions to the tested assembly

**Uncertainty of Measurement**

The uncertainties of measurements calculated for a confidence level of 95% throughout these tests are within the limits of these tolerances.

The standard specifies the following tolerances

- Forces:  $\pm 2\%$
  - Distances:  $\pm 1\text{mm}$  for tape measures  $\pm 0.01\text{mm}$  for dial gauges
  - Times:  $\pm 5\text{s}$
-

## REVISION HISTORY

This issue of the report replaces all previous issues that are now withdrawn.

<b>Issue No :</b>	<b>Re - Issue Date :</b>
<b>Revised By:</b>	<b>Approved By:</b>
<b>Reason for Revision:</b>	

<b>Issue No :</b>	<b>Re - Issue Date :</b>
<b>Revised By:</b>	<b>Approved By:</b>
<b>Reason for Revision:</b>	

**END OF REPORT**