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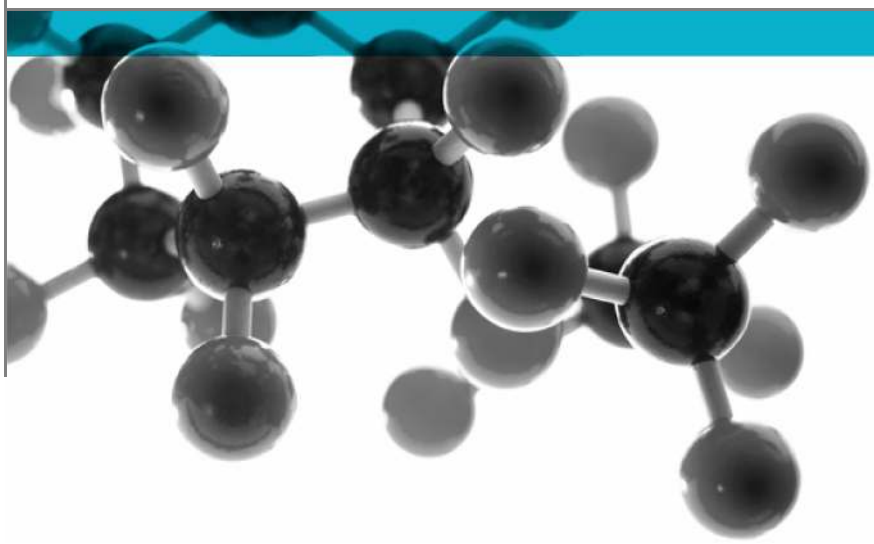
BS 6375-2:2009



Test of: Arbor-Fenex 68f Alu Clad Timber Composite Tilt & Turn Window

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

A Report To:
Selectron Elektrokimya Sanayi ve Ticaret Ltd Sti
Dereboyu Cd. Sengul Sk. No: 6 34303 Halkali / Istanbul Turkey

Document Reference:
WIL 382224

Date: 06/10/2017

Copy: 1

Issue No.: 1

Testing
Advising
Assuring

UKAS TESTING
0621

TEST CONCLUSIONS

Samples of:
Manufacturer Selectron Elektrokimya Sanayi ve Ticaret Ltd Sti
Product Window
Model Arbor-Fenex 68f Alu Clad Timber Composite Tilt & Turn Window

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

AUTHORISATION

Tests performed by: Chris Bryan, Senior Test Engineer
Jon Russell, Trainee Test Engineer
Matt Durrant, Trainee Test Engineer

Report issued by: Chris Bryan, Senior Test Engineer

Signed

Date 5th October 2017

For and on behalf of Exova (UK) Ltd

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

Signed 

Date 5th October 2017

For and on behalf of Exova (UK) Ltd

Report issued: 06 October 2017

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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	Selectron Elektrokimya Sanayi ve Ticaret Ltd Sti
Address	Dereboyu Cd. Sengul Sk. No: 6 34303 Halkali Istanbul Turkey
Contact	Hüseyin Çalişkan

ORDER DETAILS

Order number	F/A 170404
Dated	04/04/2017

SAMPLE DETAILS

Outer frame	1100 x 1600mm
Opening casements	1012 x 1512mm
Configuration	Single tilt before turn casement open-in
Material	Aluminium clad timber composite
Details of Hardware	
Hinge/Lock	Maco Tilt and turn hinges BS15 55443
Handles	Maco Multi espag lock 96561
Seals	Maco Rhapsody Handle 59501 Schlegel PE Liner, PU Foam, PP Plastic QL 3053, QL 3054

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 1191:2000 repeated opening
Sample received	16/05/2017
Test started	18/05/2017
Test completed	13/06/2017
Special Test requirements	
Other reports to be used in conjunction with this report	

TEST PROCEDURE

Introduction	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 & specification 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, & BS EN 1191:2000, classified in accordance with BS6375-2:2009, BS EN 131145:2001 & BS EN 12400:2002.
Instruction To Test	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.
Test Specimen Construction	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.
Installation	The window was supplied mounted within a timber sub-frame of nominal section 75 x 100mm fitted flush with the exterior face, in accordance with the clients fitting instructions.
Sampling	The samples were not independently witnessed or selected and were provided direct from the test sponsor.
Test Climate	The sample was conditioned in the laboratory in the range 15-30 °C and 25-75% humidity. The temperature and humidity in the lab was maintained in the range 17.9-30.0°C and 31.5-71.8% humidity for the duration of the test.

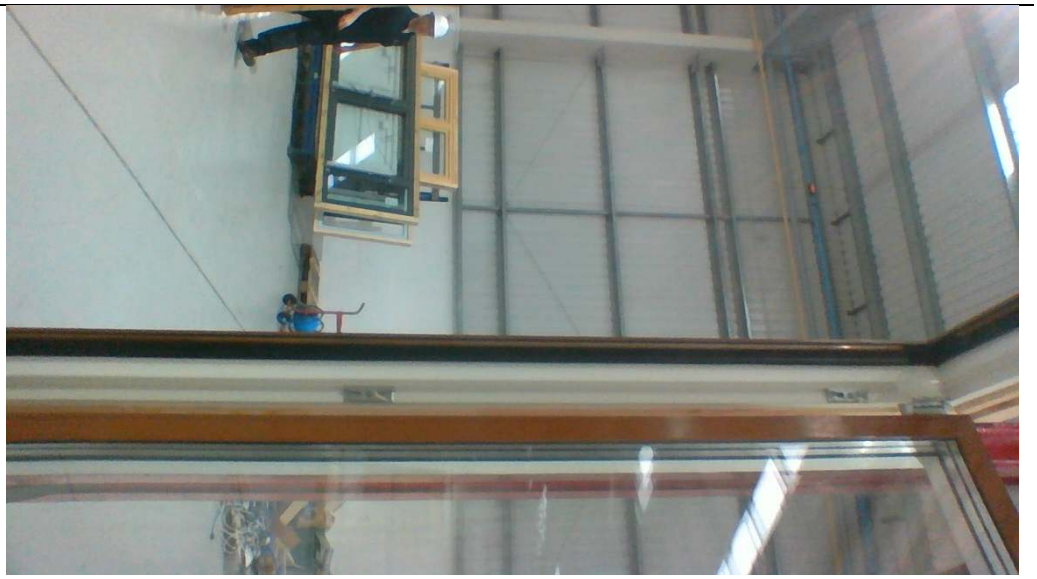
INITIAL OBSERVATIONS

The internal face of the sample

External face of the window

Sample handle

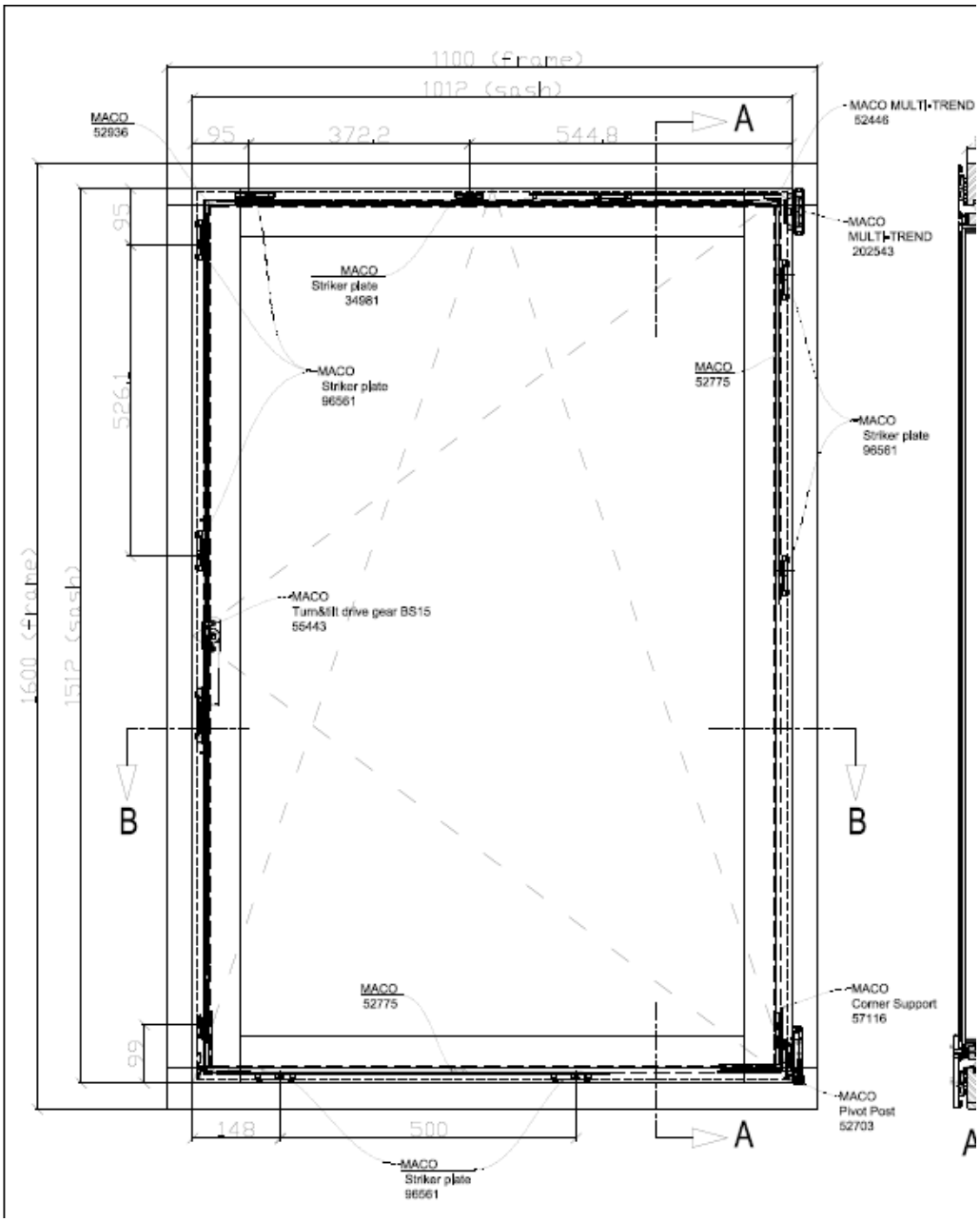
Sample hinged edge



Sample locking edge in turn mode

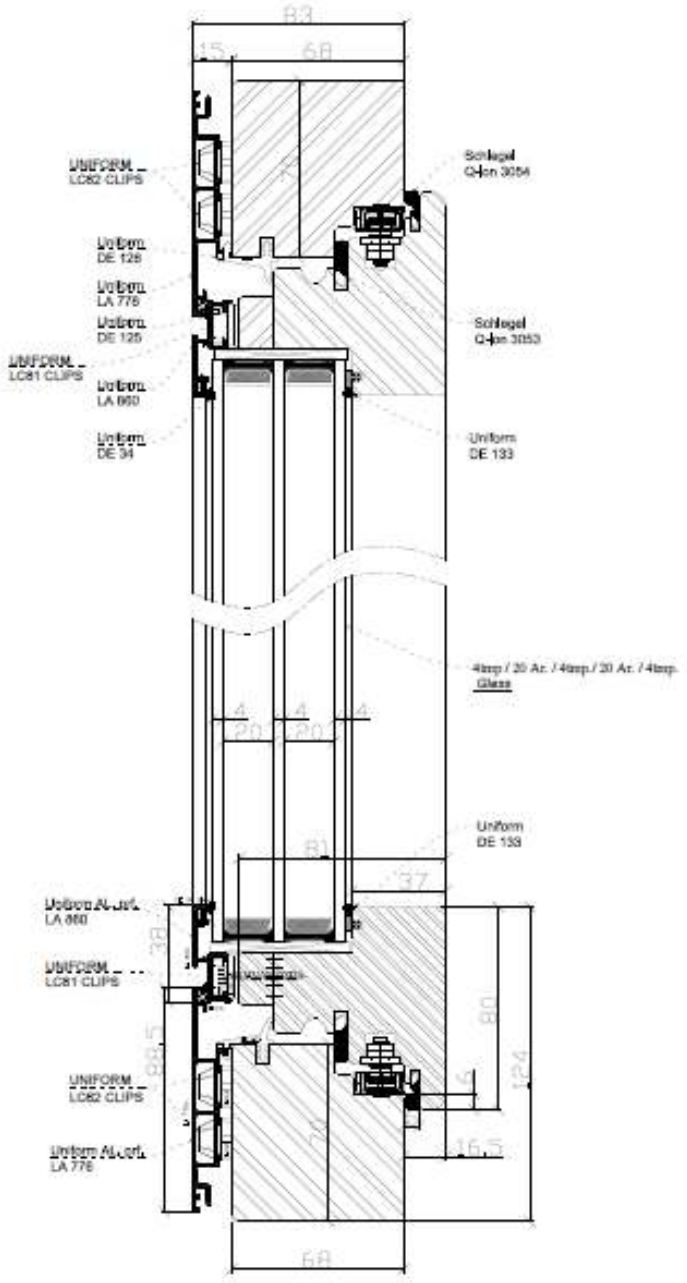
TEST SPECIMEN

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



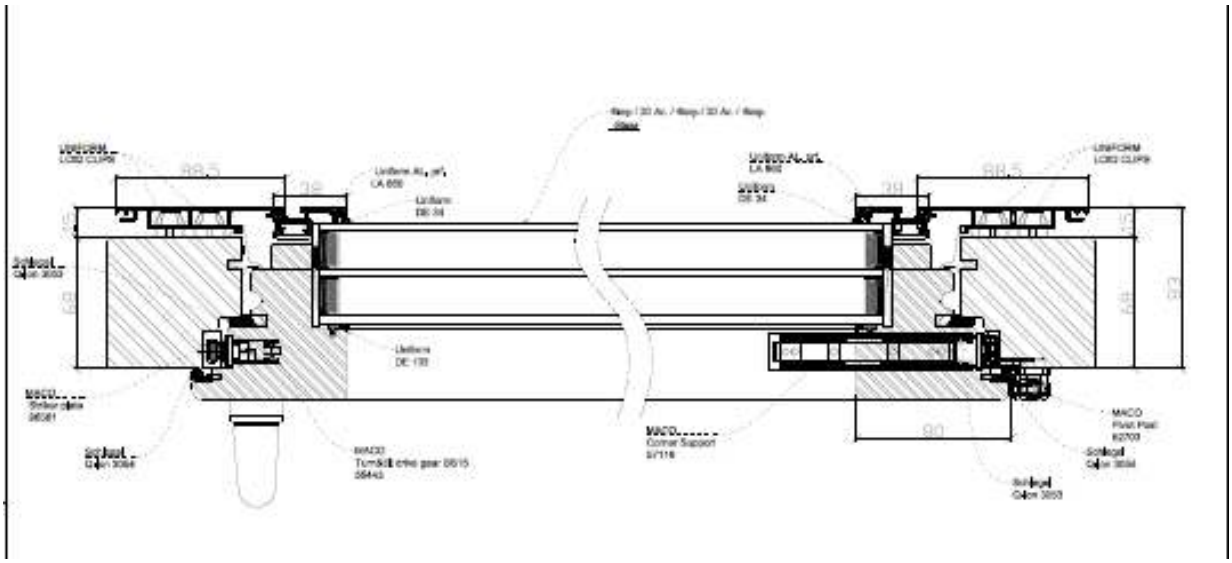
Do not scale. All dimensions are in mm

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

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

Variants

None

Item		Description
1. Window frame head		
Supplier	:	Hecht & Kloth
Material	:	Wood / Pine
Density	:	450 kg/m^3 (stated)
Glazing / casement rebate size	:	18mm
Section size	:	70 x 68mm
Fixing jamb to head joints	:	Finger Joint / Conduit
Details of adhesive		
i. supplier	:	Soudal
ii. reference	:	D4105333
2. Window frame jamb		
Supplier	:	Hecht & Kloth
Material	:	Wood / Pine
Density	:	450 kg/m^3 (stated)
Glazing / casement rebate size	:	18mm
Section size	:	70 x 68 mm
Fixing jamb to sill joints	:	Finger Joint / Conduit
Details of adhesive		
i. supplier	:	Soudal
ii. reference	:	D4105333
3. Window frame sill		
Supplier	:	Hecht & Kloth
Material	:	Wood / Pine
Density	:	450 kg/m^3 (stated)
Glazing / casement rebate size	:	18mm
Section size	:	70 x 68mm
4. Window frame weather seals		
Supplier	:	Schlegel (Germany)
Reference	:	QL 3053, QL 3054
Material	:	PE Liner, PU Foam, PP Plastic
Fixing method	:	Put into the seal groove

Item		Description
5. Window frame cladding		
Supplier	:	Uniform (Italy)
Profile code	:	LA 776
Material	:	Aluminium
Grade	:	6063 T6
Gauge / wall thickness	:	1.7mm
Section size	:	
Fixing cladding to frame		Clips (Clip fitted onto face of timber)
i. type	:	Screw
ii. size	:	16 x 18 x 13mm
iii. quantity	:	46
6. Window casement (s)		
Overall Size		1100 x 1600 mm
Supplier	:	FENEX / ARBOR
Profile codes		
i. stile profile code	:	68f-s
ii. rail profile code	:	68f-r
Material	:	Scottish Pine
Density	:	450 kg/m^3 (stated)
Glazing rebate size	:	18mm
Casement framing section size	:	68 x 70mm
Glazing rebate	:	18mm
Corner fixing method	:	Finger Joint / Conduit
Details of adhesive		
Details of adhesive		
i. supplier	:	Soudal
ii. reference	:	D4105333
7. Window casement glass		
Supplier	:	YILDIZ CAM
Thickness / configuration	:	52mm - Configuration 4mm Toughened /20 /4mm Clear / 20 /4 mm Toughened Argon, Aluminium Spacer
Overall size	:	880 x 1380 mm
Nominal edge clearance	:	4mm
8. Glazing setting blocks		
Supplier	:	Hecht & Kloth (Germany)
Material	:	Wood /Pine
Thickness	:	4mm
Section size	:	54 x 60 mm
9. Glazing tape (internal face)		
Supplier	:	Uniform (Italy)
Reference	:	DE 133
Material	:	EPDM
Thickness	:	3mm
Section size	:	8x11 mm
Fixing method	:	Put into the seal groove.

Item		Description
10. Glazing tape (external face)		
Supplier	:	Uniform (Italy)
Reference	:	DE 34
Material	:	EPDM
Thickness	:	3 mm
Section size	:	9x9 mm
Fixing method	:	Put into the seal groove.
11. Glazing beads		
Glazing method	:	Uniform (Italy) LA 860
Material	:	Aluminium Cladding
Fixing method		
i. type	:	Screw
ii. size	:	3.5 x 25 mm
iii. centres	:	200 mm
12. Window casement cladding		
Supplier	:	Uniform (Italy)
Profile code	:	LA776 & LA 860
Material	:	Aluminium Profile
Gauge / wall thickness	:	1.7mm
Section size	:	15 x 38mm
Fixing cladding to casement		Clips
i. type	:	LC81 Turning
ii. size	:	17 x 52 x 11 mm
iii. quantity	:	24
13. Glazing security clips		
Supplier	:	Uniform (Italy)
Description	:	LC 81, LC 62
Reference	:	LA 776, LA 860
Material	:	Aluminium Profile
Position	:	80 mm from corners and at 100 mm (Frame) 200mm (Sash) centres
Fixings		Clips fitted onto face of timber
i. type	:	Screw
ii. size	:	3.5 x 25 mm
iii. quantity	:	1
14. Tilt and turn hardware		
Supplier	:	MACO (Austria)
Description	:	Turn & Tilt drive gear BS15 55443
Reference	:	BS15 55443
Material	:	Steel
Fixing hardware to casement		
i. type	:	Screw
ii. size	:	3.5 x 35 mm
iii. quantity	:	10

Item		Description
Fixing hardware to frame		
i. type	:	Screw
ii. size	:	3.5 x 35 mm
iii. quantity	:	10

15. Lock Keeps

Supplier	:	MACO (Austria)
Description	:	MACO Striker plate
Reference	:	96561
Quantity	:	7 pieces
Fixing keeps to frame		
i. Type	:	Screw
ii. Size	:	3,5x35
iii. Quantity	:	2

16. Lever handles

Supplier	:	MACO (Austria)
Description	:	MACO Rhapsody Handle
Reference	:	59501
Fixings		
i. Type	:	Machine Screws
ii. size	:	M5 x 40mm
iii. quantity	:	2

PERFORMANCE CRITERIA & TEST RESULTS

Clause	Result	Pass/Fail
5.1 Operating forces – turn mode	The window was tested in accordance with EN 12046-1. The average force or torque required to disengage & 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 The sample met the requirements of Class 1. An average force of 42.17N was required to disengage the hardware. An average force of 27.23N was required to commence and maintain motion. An average force of 26.97N was required to close the sample. An average force of 66.93N was required to engage the hardware under a closing load of 0N.	**PASS CLASS 1**
5.2.1 Static torsion – turn mode	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 52.06mm, and the residual deflection was 8.81mm. Following the test 5 manual operating cycles were carried out, and the sample met the requirements of Class 1. An average force of 42.57N was required to disengage the hardware. An average force of 28.2N was required to commence and maintain motion. An average force of 83.37N was required to close the sample. An average force of 72.4N was required to engage the hardware under a closing load of 0N.	**PASS CLASS 3**
5.2.2 Racking – turn mode	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 1mm, and the residual deflection was 0mm. Following the test 5 manual operating cycles were carried out, and the sample met the requirements of Class 1. An average force of 47.43N was required to disengage the hardware. An average force of 87.83N was required to commence and maintain motion. An average force of 39.43N was required to close the sample. An average force of 74.9N was required to engage the hardware under a closing load of 0N.	**PASS CLASS 3**

Clause	Result	Pass/Fail
5.1 Operating forces – tilt mode	The window was tested in accordance with EN 12046-1. The average force or torque required to disengage & 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 The sample met the requirements of Class 1. An average force of 45.9N was required to disengage the hardware. An average force of 26.5N was required to commence and maintain motion. An average force of 12.37N was required to close the sample. An average force of 68.37N was required to engage the hardware under a closing load of 0N.	**PASS CLASS 1**
5.2.1 Static torsion – tilt mode	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 23.64mm, and the residual deflection was 0.4mm. Following the test 5 manual operating cycles were carried out, and the sample met the requirements of Class 1. An average force of 45N was required to disengage the hardware. An average force of 25.5N was required to commence and maintain motion. An average force of 12.43N was required to close the sample. An average force of 68.23N was required to engage the hardware under a closing load of 0N.	**PASS CLASS 3**
5.2.2 Racking – tilt mode	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 17.14mm, and the residual deflection was 3.04mm. Following the test 5 manual operating cycles were carried out, and the sample met the requirements of Class 1. An average force of 48.27N was required to disengage the hardware. An average force of 24.7N was required to commence and maintain motion. An average force of 16.27N was required to close the sample. An average force of 46.87N was required to engage the hardware under a closing load of 0N.	**PASS CLASS 3**
5.3 Load-bearing capacity of safety devices	This test was not carried out as no such device was fitted to the window.	**PASS**

Clause	Result	Pass/Fail
5.4 Impact resistance	The recommended class for the UK is Class 0, no performance is required.	**PASS CLASS 0**
5.5 Resistance to repeated opening and closing	Prior to the cyclic operation test, when tested in accordance with EN 12046-1, the sample met the requirements of Class 1. An average force of 52.9N was required to disengage the hardware to tilt mode 90 degrees. An average force of 41.3N was required to disengage the hardware to turn mode 180 degrees. An average force of 15.5N was required to commence and maintain motion in tilt mode. An average force of 16.2N was required to close the sample in tilt mode. An average force of 41.3N was required to commence and maintain motion in turn mode. An average force of 21.0N was required to close the sample in turn mode. An average force of 74.5N was required to engage the hardware to tilt mode 90 degrees under a closing load of 0N. An average force of 30.5N was required to engage the hardware to fully closed 0 degrees under a closing load of 0N.	**PASS**
	The number of cycles completed by the window in turn mode was 10,000, as required by Class 2 of the standard. The stroke of the casement was 90 degrees. Observations and measurement were carried out at intervals of 25% of the total cycles. No lubrication or adjustment was specified by the client. The dead load applied on the casement by the operating equipment was 2.8 kg.	**PASS**
	Following the cyclic operation test in turn mode, when tested in accordance with EN 12046-2, the sample continued to meet the requirements of Class 1. An average force of 35.8N was required to disengage the hardware to tilt mode 90 degrees. An average force of 37.5N was required to disengage the hardware to turn mode 180 degrees. An average force of 22.1N was required to commence and maintain motion in tilt mode. An average force of 11.0N was required to close the sample in tilt mode. An average force of 11.4N was required to commence and maintain motion in turn mode. An average force of 25.5N was required to close the sample in turn mode. An average force of 73.2N was required to engage the hardware to tilt mode 90 degrees under a closing load of 0N. An average force of 28.2N was required to engage the hardware to fully closed 0 degrees	**PASS**

Clause	Result	Pass/Fail
	under a closing load of 0N.	
	The number of cycles completed by the window in tilt mode was 10,000, as required by Class 2 of the standard. The stroke of the casement was the maximum allowed by the casement. Observations and measurement were carried out at intervals of 25% of the total cycles. No lubrication or adjustment was specified by the client.	**PASS CLASS 2**
	Following the cyclic operation test in tilt mode, when tested in accordance with EN 12046-2, the sample continued to meet the requirements of Class 1.	**PASS**
	An average force of 35.5N (V=-33%) was required to disengage the hardware to tilt mode 90 degrees. An average force of 41.1N (V=0%) was required to disengage the hardware to turn mode 180 degrees.	
	An average force of 22.3N (V=44%) was required to commence and maintain motion in tilt mode. An average force of 11.5N (V=-29%) was required to close the sample in tilt mode.	
	An average force of 11.6N (V=-72%) was required to commence and maintain motion in turn mode. An average force of 26.3N (V=25%) was required to close the sample in turn mode.	
	An average force of 75.5N (V=1%) was required to engage the hardware to tile mode 90 degrees under a closing load of 0N. An average force of 30.1N (V=-1%) was required to engage the hardware to fully closed 0 degrees under a closing load of 0N.	

CONCLUSIONS

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	

LIMITATIONS

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: ±2% ▪ Distances: ±1mm for tape measures ± 0.01mm for dial gauges ▪ Times: ±5s

REVISION HISTORY

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

Issue No :	**Re - Issue Date :**
Revised By:	**Approved By:**
Reason for Revision:	

Issue No :	**Re - Issue Date :**
Revised By:	**Approved By:**
Reason for Revision:	

END OF REPORT