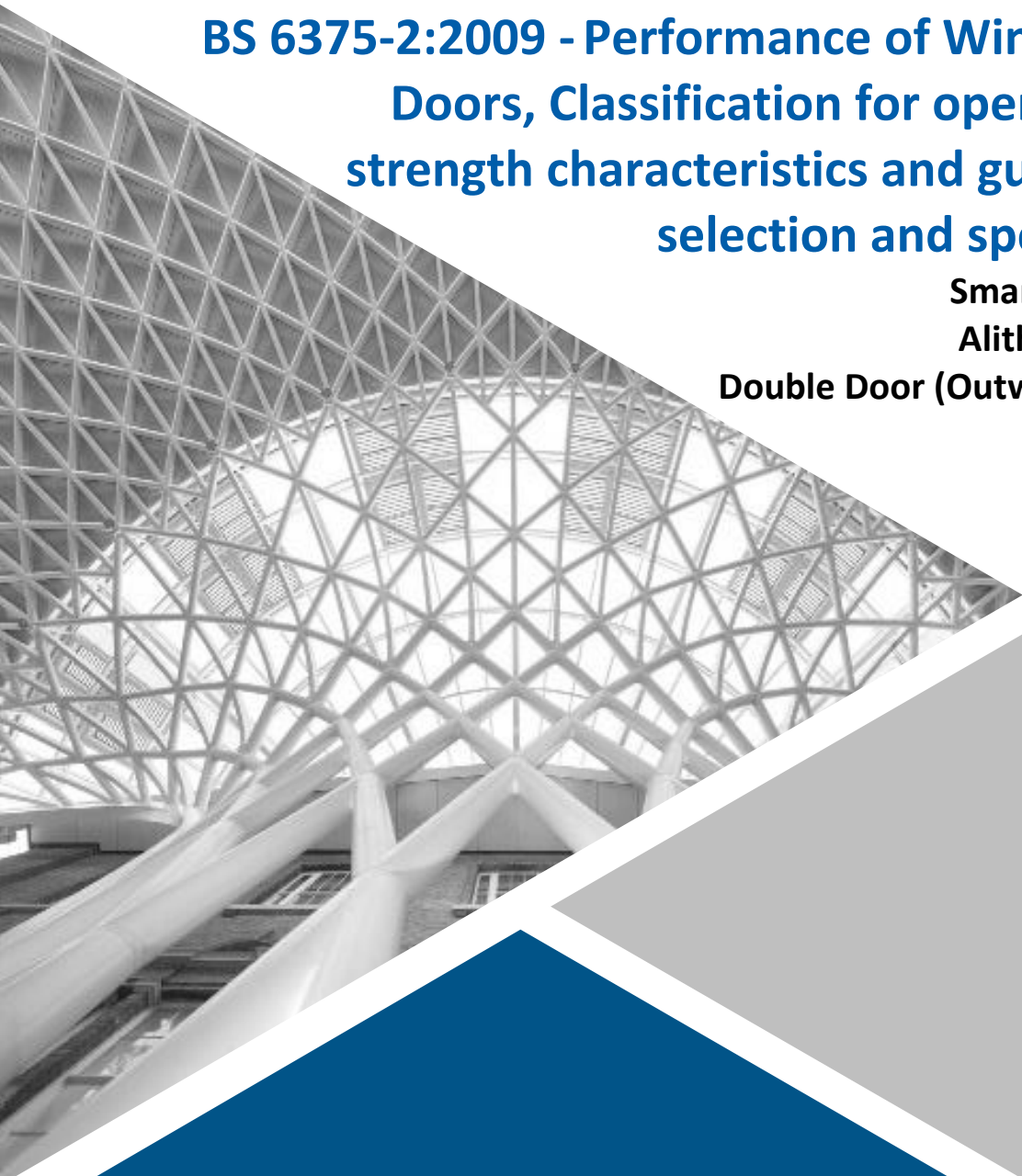


Technical Report – R20603
BS 6375-2:2009 - Performance of Windows and
Doors, Classification for operation and
strength characteristics and guidance on
selection and specification

Smart Systems Ltd
Alitherm Heritage
Double Door (Outward Opening)



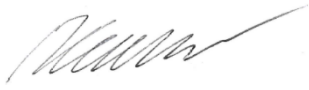

Contents

1. Introduction.....	2
2. Summary of Results.....	3
3. Description of Test Sample.....	4
4. Test Arrangement.....	7
5. Test Procedures.....	8
6. Test Results	11
7. System Drawings	14

1. Introduction

This report describes tests carried in order to determine the durability of the sample with respect to operating forces, mechanical strength and resistance to repeated operation of the test specimen supplied as follows:

Test Details	
Customer:	Smart Systems Ltd Arnolds Way Yatton North Somerset BS49 4QN
Product Tested:	Double Doors
Date of Sample Received:	30 th August 2019
Date of Test:	15 th October – 9 th December 2019
Test Conducted at:	Wintech Engineering Limited Halesfield 2 Telford Shropshire TF7 4QH
Test Conducted by:	D Knight - Laboratory Technician D Adams - Laboratory Technician

Report Authorisation	
Report Compiled by:	R Cadwallader Project Handler 
Authorised by:	M Witkowska Engineering Associate Lead 

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2. Summary of Results

The following summarises the results of testing carried out, in accordance with the relevant testing and classification standards.

The performance of the sample tested has been assessed against the criteria described in below standards. The results as reported will be used to determine the conformance or non-conformance with the specification without making any consideration of the uncertainty.

<i>Test Method & Classification Standard</i>	<i>Description</i>	<i>Classification</i>
BS EN 12046-2:2000 BS EN 12217:2003	Operating forces	Class 1
BS EN 1192:2000	Mechanical Strength	Class 2
BS EN 947:1999 BS EN 1192:2000	Vertical load	600 N
BS EN 948:1999 BS EN 1192:2000	Static torsion	250 N
BS EN 949:1999 BS EN 1192:2000	Soft & heavy impacting	60 J
BS EN 950:1999 BS EN 1192:2000	Hard body impacting	3 J
BS EN 1191:2012	Repeated opening and closing	Class 4

More comprehensive details are reported in Section 6.

These results are valid only for the conditions under which the test was conducted
 All measurement devices, instruments and other relevant equipment were calibrated and traceable to National Standards.

3. Description of Test Sample

The description of the test sample in this section has been supplied by Smart Systems Ltd and has not been verified by Wintech Engineering Limited.

See Section 7 for test sample drawings as supplied by Smart Systems Ltd.

Project number:	20603
Product range name:	Alitherm Heritage
Configuration:	Double door
Opening direction:	Open Out, Full Frame
Product manufacturer:	Smart systems
Is the sample typical of normal production?	yes
Please define the closing condition of the sample i.e. closed, fastened, latched, locked and secured etc.	Locked

Outer Frame

Outer frame width:	1800mm	Outer frame material:	Aluminium
Outer frame height:	2200mm	Outer frame gasket	
Outer frame Part Numbers		Gasket type:	EDPM
Top:	W20015	Manufacturer:	Smarts
Bottom:	W20015	Product name:	Flipper Gasket
Lock side:	W20015	Product code:	ACET160
Hinge side:	W20015	Threshold	
Outer frame section size		Manufacturer:	SMARTS
Width:	33mm	Product name:	Alitherm Heritage
Depth:	47mm	Product code:	W20015
		Material:	Aluminium
Manufacturer:		Outer frame joint method	
Product name:		Head:	Glue and Crimp
Product code:		Foot:	Glue and Crimp
Material:		Surface Finish	Powder coat

Leaf

Leaf/Casement width:	883mm	Leaf/ Casement material:	Aluminium
Leaf/ Casement height:	2175mm	Leaf/ Casement gasket	
Leaf/ Casement Part Numbers		Gasket type:	EDPM
Top:	W20129	Manufacturer:	Smarts
Bottom:	W20129	Product name:	Flipper Gasket
Lock side:	W20129	Product code:	ACET160
Hinge side:	W20129	Leaf Transom and lockbox	
Leaf/ Casement section size		Manufacturer:	Smarts
Width:	54mm	Product name:	Alitherm Heritage
Depth:	59mm	Product code:	W20135, W20038
Mullion		Material:	Aluminium
Manufacturer:	Smarts	Leaf/Casement joint method	
Product name:	Mullion	Head:	Glue and Crimp
Product code:	W20046	Foot:	Glue and Crimp
Material:	Aluminium	Surface Finish	Powder Coating

Glazing

Glass unit		Glazing gasket	
Manufacturer:	Ashton Glass	Gasket type:	Glazing gasket
Inner thickness:	6mm	Manufacturer:	Smarts
Spacer material:	Aluminium	Product name:	Alitherm Heritage
Outer thickness:	6mm	Product code:	ACET 843 E Gasket ACET 840 Wedge Gasket
Unit sizes:	798mm x 789mm 731mm x 281mm 798mm x 978mm	Glazing clip	NA
Bead		Manufacturer:	
Manufacturer:	Smarts	Product name:	
Product name:	Alitherm Heritage	Product code:	
Product code:	W20171	Glazing tape details	NA
Bead size:	15.5mm x 8.5mm	Manufacturer:	
Bead material:	Aluminium	Product name:	
		Product code:	

Hardware

	Manufacturer:	Product description:	Product code:	Quantity:
Hinges:	Banks	Open in Hinge	ACW20060	8
Hinge fixing:	Banks	M4 X 25MM Fixing Plate	Supplied with hinge	
Hinge protectors:	Fuhr		ACW20375	8
Hinge protector fixings:		M4 x 15mm ,M4 Insert M4 Fixing Plate M4 x 25	Supplied With Hinge	
Locking hardware:	Fuhr	Primary Door Lock	ACW20365	1
		Secondary Door Lock	ACW20366	1
		Top Shoot bolt	ACDV738	2
		Bottom Shoot bolt	ACDV737	2
Locking hardware fixing:	Smarts		M4 Insert M4 x 25MM	16
Cylinder:	ERA	45/40 Three Star Cylinder	ACCY3045S3	2
Cylinder fixing:		M5 X 100MM		2
Handle:	Trojan	Lever/Lever	ACW20061	2
Handle fixings:		M5X70mm	Supplied with handles	6
Mullion End Caps	Smarts		ACW20144	2
Shoot bolt Keeps	Smarts	Shoot bolt keeps	ACW20345	2
Center Keeps	Fuhr	Center Keep	ACW20066	1
Keeps:	Fuhr	Supplied with locks		4
Keep fixings:	Smarts	Lock keeps	No .8 x 32mm	12
		ShootBolt Keeps	No.7 x 25mm	10
		Center Keep	No 8 x 32mm	4
Drip bar:	NA			
Drain Caps	Smart	Drain Caps.	ACET131	4
Run up Blocks	Smarts	Run up Blocks to Head and cill	ACET380	4

Confirmation

Please confirm that the samples provided for testing are representative of standard production?	Yes.
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4. Test Arrangement

4.1 Test Rig

The test sample was mounted in to a 100 x 75 mm timber sub-frame in accordance with manufacturer's installation requirements and was secured into the test rig ready for testing.

4.2 Instrumentation

4.2.1 Force Measurement

Calibrated force gauges and load cells were used to measure operation forces to +/- 5%.

4.2.2 Time

A calibrated stop watch was used to measure/record time

4.2.3 Torque

A calibrated torque meter was used for recording forces required to operate any finger operated hardware with an accuracy of +/- 5%

4.2.4 Scales

The mass of the opening leaf was measured using scales accurate to +/- 2%

4.2.5 Measuring Tape

A measuring tape and rule accurate to +/- 0.5mm were used

4.2.6 Impactor

4.2.6.1 Soft & heavy Impactor

A spherical leather bag with a total body mass of 30 Kg \pm 0.6Kg of an approximately 350mm diameter was used for soft and heavy body impacts

4.2.6.2 Hard body Impactor

A 50mm \pm 1mm steel ball was used for hard body impacts

4.2.7 Temperature & Humidity

A digital data logger capable of measuring temperature with an accuracy of \pm 1°C and humidity with an accuracy of \pm 5 %Rh was used.

5. Test Procedures

5.1 Sequence of Testing

Sample 1

1. Operating Forces
2. Vertical Load
3. Static Torsion
4. Soft & Heavy Body Impact Resistance
5. Hard Body Impact Resistance

Sample 2

6. Operating Forces
7. Resistance to Repeated Opening and Closing
8. Operating Forces

5.2 Operating forces

5.2.1 Dynamic closing

Prior to testing the door, all moving parts were manually operated 5 times as required by the test standard

A pulley system used together with a nylon cord and a series of weights was attached adjacent to the door handle in order to create a dynamic closing action.

The weight was adjusted in 1N increments in order to determine the minimum force required to latch the door from a distance of 200mm.

This method was repeated three times with the results averaged to obtain the final value.

5.2.2 Operating hardware

The minimum force to engage the latch, lock and unlock the hardware before finally unlatching the hardware was recorded.

The sequence was repeated three times with the results averaged to obtain the final value.

5.2.3 Opening forces

The minimum force to commence and maintain the motion of the door leaf to a distance of 200mm was recorded.

The sequence was repeated three times with the results averaged to obtain the final value.

5.3 Resistance to vertical load

Without any vertical restraint, the door leaf was positioned at an angle of 90° to the plane of the frame and the diagonal measurement of the door leaf recorded.

A pre-load was applied vertically to the upper lock side corner and held for a period of 60 secs, the load was removed and following a rest period of 60 secs the location of the lower lock side corner recorded.

The test force was then applied to the upper lock side corner and held for a period of 5 mins. On completion of the 5 mins, a measurement of the location of the lower lock side corner of the door leaf was recorded and the load was then removed.

Following a 3 min period with no load applied to the sample, further measurements of both the lower lock side corner location and the diagonal of the door leaf were recorded.

5.4 Resistance to static torsion

Without any vertical restraint, the door leaf was positioned at an angle of 90° to the plane of the frame, with the top lock side corner secured.

A pre-load was applied horizontally to the plane of the leaf to the lower lock side corner and held for a period of 60 secs, the load was then removed and following a rest period of 60 secs the location of the lower lock side corner recorded.

The test force was then applied to the same loading point and held for a period of 5 mins. On completion of the 5 mins a measurement of the location of the lower lock side corner was recorded then the load removed.

Following a 3 min period in which no load was applied to the sample, a further measurement of the lower lock side corner location recorded.

5.5 Soft and heavy impacting

With the door leaf closed, and where applicable secured in accordance with its normal operating mode, the centre of the door was identified as the impact point.

Using a reference bar and Digital depth gauge, any deviation in the flatness of the door leaf was recorded. The Impactor was then suspended so that it made light contact with the surface of the door leaf, and its centre of gravity was positioned on a line perpendicular to the door leaf.

The Impactor was released and the door leaf impacted following which the reference bar and Digital depth gauge were used to determine any change to the flatness of the door leaf.

This procedure was conducted 3 times with the flatness being recorded following each impact.

The same sequence of impacting was then repeated on the other face of the door sample.

5.6 Hard body impacting

With the door leaf positioned horizontally and supported under its two longest edges, pattern 4 was selected from the four aiming patterns shown in the test standard. The impact positions contained within this pattern were deemed to coincide with theoretically the weakest points on the door leaf, with any glazed areas being omitted from the test, reducing the number of impact points.

The impactor was dropped on each impact point and any indentation measured and recorded for diameter, depth and cracking.

5.7 Resistance to Repeated Opening and Closing

5.7.1 Prior to the test

The mass of the casement, sash or leaf was measured prior to any testing.

With the test sample installed in accordance to clause 6 of EN 1191:2012, the sample was subject to 5 manual operations before the following initial measurements were taken:

- a) The operating forces, measured in accordance with BS EN 12046-2:2000
- b) The mass of the leaf
- c) The dead load applied by the operating equipment on the leaf

The operating equipment was adjusted in accordance with the operation of the hardware its reference velocity and attainment of forces within the specified limits, the rest times and strokes.

5.7.2 Cyclic test

The sample was subject to repeated opening and closing as outlined in Annex H of BS EN 1191:2012. Throughout the test, the operating hardware was subject to the required number of cycles as was the sash/sashes.

The test was configured for the correct amount of cycles according to the required classification as outlined in BS EN 12400:2002.

At every period equal 2500 cycles or 25% of the specified total test cycles, whichever is the greater, the test was halted and the test specimen was examined and the operating forces were measured and if necessary, lubrication and adjustment was carried out in accordance with the manufacturers maintenance instructions. The test was continued in the defined conditions for the next period.

The test was continued until the defined number of cycles was completed.

5.7.3 Following the test

Following the completion of the defined number of cycles, the following measurements were taken:

- a) The operating forces, measured in accordance with BS EN 12046-2:2000
- b) The mass of the leaf
- c) The dead load applied by the operating equipment on the leaf

6. Test Results

6.1 Lab Conditions

The conditions measured inside the laboratory were as follows:

	Temperature °C	Humidity %rh
At start of test	18.8	53.8
At completion of test	20.1	32.1

6.2 Operating forces

The results of the tests carried out are as follows:

	Primary Leaf	Secondary Leaf	Class
Closing Force (N)	8.8	15.47	3
Latch Hardware (N)	84.53	54.63	1
Lock Hardware (Nm)	0.30	0.30	4
Unlock Hardware (Nm)	0.30	0.30	4
Unlatch Hardware (N)	56.33	36.43	1
Commence Opening (N)	55.87	51.50	2
Maintain Opening (N)	6.63	6.87	4
Overall Classification according to BS EN 12217:2003			1

Following testing the sample was opened, closed and all hardware operated to ensure the sample remained fully functional, which it was.

The overall classification for operating forces is: **CLASS 1**

6.3 Mechanical Strength

6.3.1 Resistance to vertical load

	Primary Leaf	Secondary Leaf
Test Load	600 N	600 N
Deformation Under Load	1.32 mm	1.10 mm
Residual Deformation Following Test		
Vertical Deformation	0.59 mm	0.44 mm
Diagonal Deformation	0.0 mm	0.0 mm

Following the test, there were no signs of any damage to the test sample and it remained functional.

6.3.2 Resistance to static torsion

	Primary Leaf	Secondary Leaf
Test Load	250 N	250 N
Deformation Under Load	100.2 mm	84.33 mm
Residual Deformation Following Test	1.3 mm	0.72 mm

Following the test, there were no signs of any damage to the test sample and it remained functional.

6.3.3 Resistance to soft and heavy body impacting

Inside Face of Doorset

Impact Ref	Energy (J)	Primary Leaf		Secondary Leaf	
		Deviation in flatness (mm)	Damage caused to the sample	Deviation in flatness (mm)	Damage caused to the sample
Impact 1	60	0.30	None	0.23	None
Impact 2	60	0.06	None	0.12	None
Impact 3	60	0.19	None	0.11	None

Following the test, there were no signs of any damage to the test sample and it remained functional.

Weather Face of Doorset

Impact Ref	Energy (J)	Primary Leaf		Secondary Leaf	
		Deviation in flatness (mm)	Damage caused to the sample	Deviation in flatness (mm)	Damage caused to the sample
Impact 1	60	0.24	None	0.14	None
Impact 2	60	0.07	None	0.32	None
Impact 3	60	0.05	None	0.21	None

Following the test, there were no signs of any damage to the test sample and it remained functional.

6.3.4 Resistance to hard body impacting

Aiming pattern	2
Impact Energy (J)	3

Impact Number	Primary Leaf		
	Depth of Indent (mm)	Diameter of Indent (mm)	Diameter of cracking (mm)
1	0.0	0.0	0.0
2	0.0	0.0	0.0
3	0.0	0.0	0.0
4	0.0	0.0	0.0
5	0.0	0.0	0.0
Mean	0.0	0.0	0.0
Co-efficient of variation	0.0	0.0	0.0

Following the test, there were no signs of any damage to the test sample and it remained functional.

6.4 Overall Classification for Mechanical Strength

The overall classification for mechanical strength is: **CLASS 2**

6.5 Resistance to Repeated Opening and Closing

6.5.1 Initial Measurements

Description	Primary Leaf	Secondary Leaf
Mass of leaf (kg)	69	69
Dead load applied by the operating equipment (kg)	0.07	0.0
Stroke of casement	90°	90°

The operating forces measured before the test are as follows:

Description	Primary Leaf	Secondary Leaf	Classification
Closing Force (N)	7.2	10.6	3
Latch Hardware (N)	2.0	46.6	2
Lock Hardware (Nm)	0.1	0.2	4
Unlock Hardware (Nm)	0.1	0.2	5
Unlatch Hardware (N)	73.1	58.8	2
Commence Opening (N)	6.6	6.6	4
Overall Classification according to BS EN 12217:2003			2

6.5.2 Cycle Test

The number of cycles completed by the sample was **50,000** on the Primary Leaf and **5,000** on the Secondary Leaf as required by **Class 4** of the standard.

The sample was lubricated as specified by the manufacturer at each period equal to 2500 cycles or 25% whichever the greater and adjustments were carried out as follows:

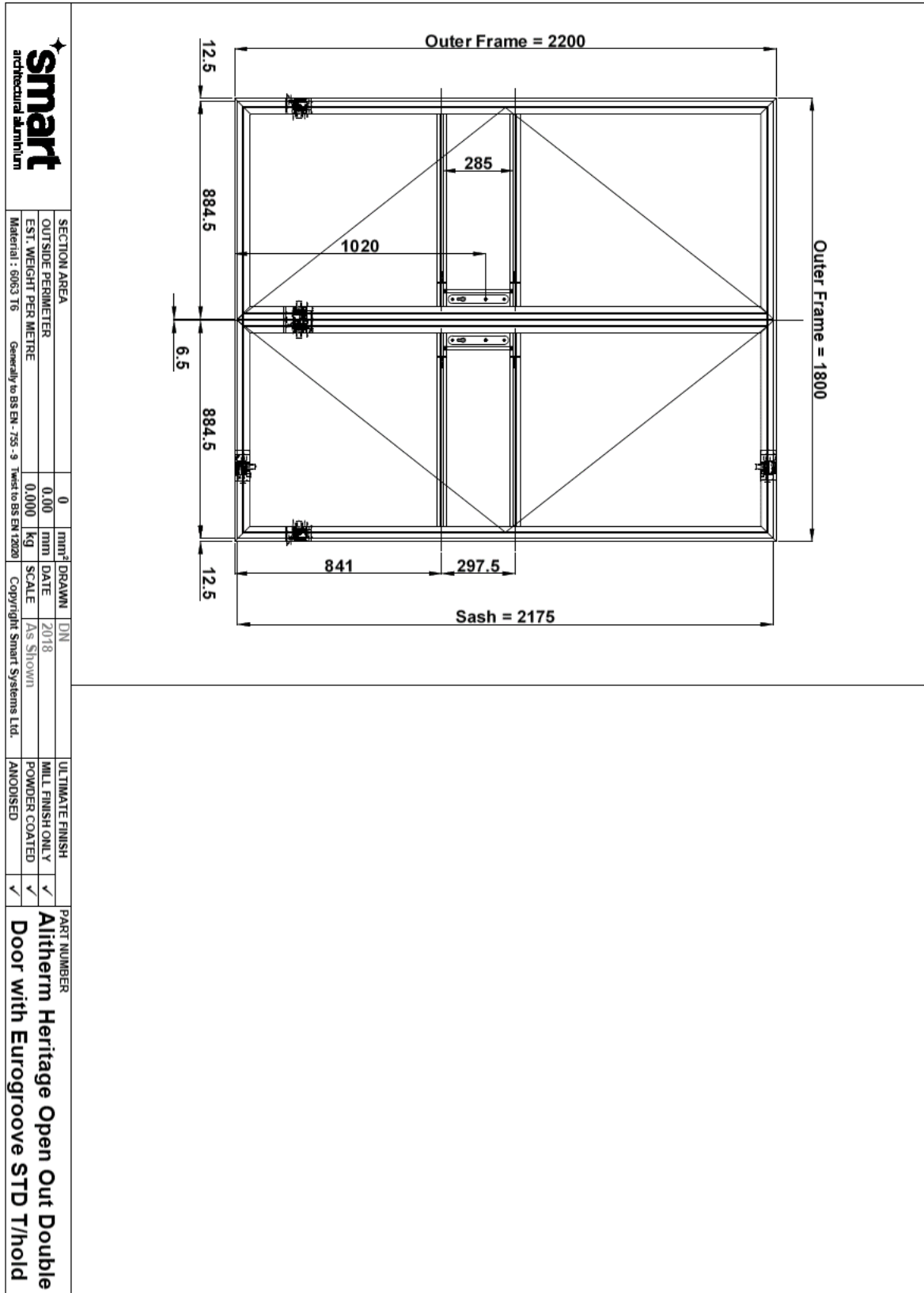
6.5.3 Final Measurements

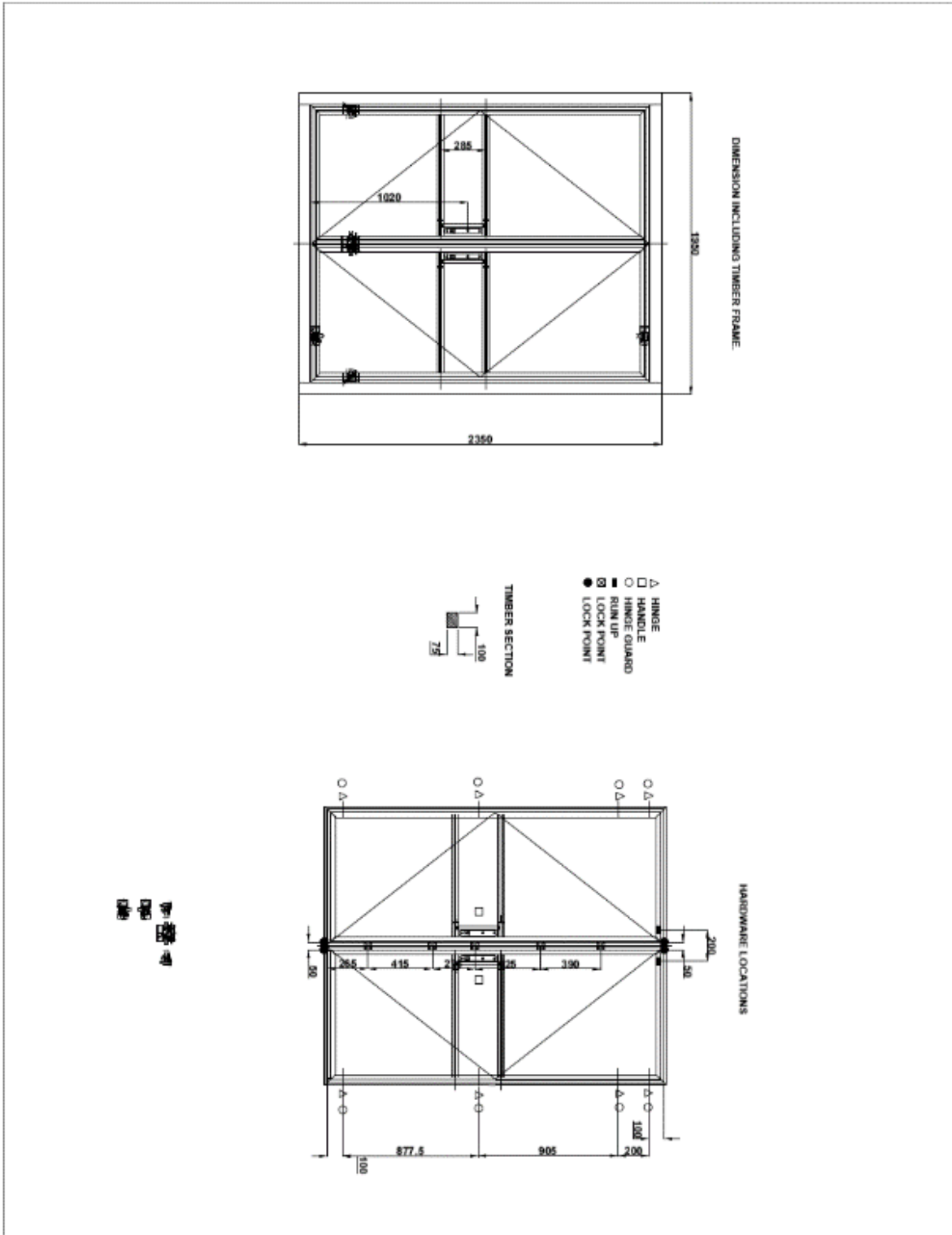
Description	Primary Leaf	Secondary Leaf
Mass of leaf (kg)	69	69
Dead load applied by the operating equipment (kg)	0.07	0.07
Stroke of casement	90°	90°


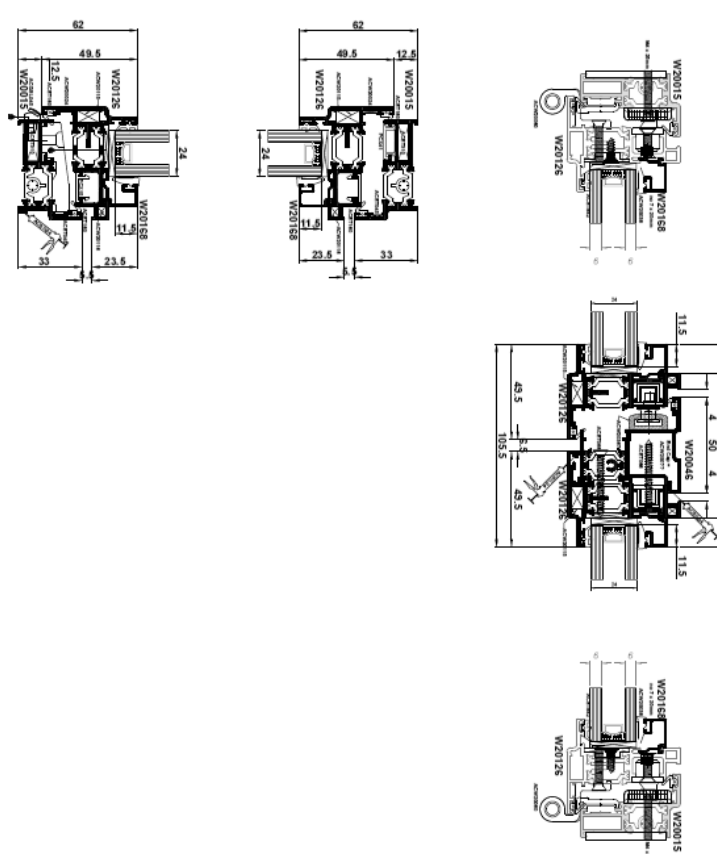
The operating forces measured following the test are as follows:

Description	Primary Leaf	Secondary Leaf	Classification
Closing Force (N)	13.8	7.9	3
Latch Hardware (N)	38.4	44.5	2
Lock Hardware (Nm)	0.1	0.2	4
Unlock Hardware (Nm)	0.1	0.2	5
Unlatch Hardware (N)	39.8	45.2	2
Commence Opening (N)	8.8	6.9	4
Overall Classification according to BS EN 12217:2003			2

7. System Drawings





	SECTION AREA		0	mm ²	DRAWN	DN	ULTIMATE FINISH	PART NUMBER Alitherm Heritage Open Out Double Door with Eurogroove STD T/hold
	OUTSIDE PERIMETER		0.00	mm	DATE	2018	MILL FINISH ONLY	
	EST. WEIGHT PER METRE		0.000	kg	SCALE	As Shown	POWDER COATED	
Material : 6063 T6		Generally to BS EN - 755 - 9		twist to BS EN 12020		Copyright Smart Systems Ltd.	ANODISED	
								

----- END OF REPORT -----

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☎ +44 (0) 1952 586580

✉ sales@wintechtesting.com

🌐 www.wintechtesting.com