Test Report 8420999.

Smart Systems Limited

Incorporating Smart Extrusions

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Introduction.

This report has been prepared by Jack Nicholls and relates to the activity detailed below:

Job/Registration Details		Client Details
Job number:	**8420999**	Smart Systems Limited Incorporating Smart Extrusions Arnolds Way Yatton BS49 4QN United Kingdom
Job type:	Testing Samples Submitted	
Start Date:	11/12/2015	
Test type:	Type	
Sample ID:	10158566	
Registration:	**KM 81543**	
Scheme:	BS 4873	
Protocol:	PP 519	
Scheme Mgr:	Lorraine Balch	
Quality system:	ISO 9001:2008	

The report has been approved for issue by Mark Manito – Team Manager

Approved For Issue	
[redacted]	Issue Date:17 November 2016

Objectives.

Type Test for Product Certification

Product Scope.

Smart Systems Eco Futural Aluminium Alloy Windows

Report Summary.

The samples were received on 10 December 2015 and the testing was started on 16 December 2015.

The samples submitted complied with the requirements of the test work conducted.

Eco Futural Side Hung Next to Side Hung.

Outer Frame width	1722MM	**Outer Frame Material**	ALUMINIUM
Outer Frame height	1440MM	**Outer Frame Gasket**	
Outer Frame Part Numbers		Gasket Type	EDPM
Top	EF910	Manufacturer	EBP
Bottom	EF910	Product Name	ECO FUTURAL
Lock Side	EF910	Product Code	ACVL032
Hinge Side	EF910	**Threshold**	
Outer Frame section dimensions		Manufacturer	
Width	44MM	Product name	
Depth	65MM	Product Code	
Reinforcing:		Materials	
Manufacturer	NA	**Outer Frame Joint Method**	
Product Name		Head	CRIMP, GLUED, SEALED
Product code		Foot	
Material			

Leaf		**Leaf Material:**	ALUMINIUM
Leaf Width:	838MM	**Leaf Gasket**	
Leaf Height:	1405MM	Gasket type:	EDPM
Leaf Part Numbers:		Manufacturer:	EBP
Top:	EF926	Product Name:	ECO FUTURAL
Bottom:	EF926	Product Code	ACVL032
Lock side:	EF926	**MULLION**	
Hinge Side	EF926	Manufacturer:	SMART SYSTEMS
Leaf section size		Product name:	ECO FUTURAL
Width:	74MM	Product code:	EF930
Depth:	65MM	Material:	ALUMINIUM
Reinforcing		**Leaf joint method**	
Manufacturer:	NA	Head:	CRIMPED, GLUED, SEALED
Product Name:		Foot:	
Product Code:			
Material:			
Bead			
Manufacturer:	SMART SYSTEMS		
Product Name:	ECO FUTURAL		
Product Code:	GL526		
Material:	ALUMINIUM		
Bead Size:	22MM X 26MM.		

Eco Futural Side Hung Next to Side Hung. (continued)

Glazing Unit		**Glazing Gasket**	
Manufacturer:	MACROE GLASS	Gasket Type:	EDPM
Inner Thickness:	6MM	Manufacturer:	SEMPERIT PROFILES
Spacer Material:	ALUMINIUM	Product Name:	ECO FUTURAL
Outer Thickness:	6MM	Product Code	ACFT031N, ACFT033N
Unit Sizes:	720MM X 1227MM	**Glazing Clip**	NA
Glazing Tape Details		Manufacturer:	
Manufacturer:	NA	Product Name:	
Product Name:		Product Code	
Product Code			

Hardware			**Fixings**	**Quantity**
Hinges:	ACINSSH16		ACET070, ACET099	2PRS
Hinge Protectors:	ACET516		ACET060	4 PRS
Lock:	ACET956		ACET060	2
Cylinder:				
Handle:	ACCET868		HEA132SSZ	2 PRS
Touch Bar:				
Cylinder Support:				
Cylinder Escutcheon:				
Keeps:				
Drip Bar				
Additional Hardware	ACEF980	RUN UP BLOCKS		8
	ACGSL045	DRAIN CAPS		4
	ACSIL04	SEALANT		
	ACSIL013	CLEAT GLUE.		
	ACMX09830	GASKET SEALANT		

Eco Futural Top Hung Window.

Outer Frame width	1475MM	**Outer Frame Material**	Aluminium
Outer Frame height	2535MM	**Outer Frame Gasket**	
Outer Frame Part Numbers		Gasket Type	EDPM
Top	EF910	Manufacturer	EBP
Bottom	EF910	Product Name	ECO FUTURAL
Lock Side	EF910	Product Code	ACVL 032
Hinge Side	EF910	**Threshold**	
Outer Frame section dimensions		Manufacturer	
Width	44MM	Product name	
Depth	65MM	Product Code	
Reinforcing:		Materials	
Manufacturer	NA	**Outer Frame Joint Method**	
Product Name	NA	Head	CRIMPED, GLUED, SEALED.
Product code	NA	Foot	
Material	NA		

Leaf		**Leaf Material:**	ALUMINIUM
Leaf Width:	1440MM	**Leaf Gasket**	
Leaf Height:	2500MM	Gasket type:	EDPM
Leaf Part Numbers:		Manufacturer:	EBP
Top:	EF926	Product Name:	ECO FUTURAL
Bottom:	EF926	Product Code	ACVL 032
Lock side:	EF926	**Leaf Midrail:**	
Hinge Side	EF926	Manufacturer:	
Leaf section size		Product name:	
Width:	74MM	Product code:	
Depth:	65MM	Material:	
Reinforcing		**Leaf joint method**	
Manufacturer:		Head:	CRIMPED, GLUED, SEALED
Product Name:		Foot:	
Product Code:			
Material:			
Bead			
Manufacturer:	SMART SYSTEMS		
Product Name:	ECO FUTURAL		
Product Code:	GL526		
Material:	ALUMINIUM		
Bead Size:	22MM X 26MM		

Eco Futural Top Hung Window. (continued)

Glazing Unit		**Glazing Gasket**	
Manufacturer:	MACROE GLASS	Gasket Type:	EDPM
Inner Thickness:	6MM TOUGHENED	Manufacturer:	SEMPERIT PROFILES
Spacer Material:	16MM ALUMINIUM	Product Name:	ECO FUTURAL
Outer Thickness:	6MM TOUGHENED	Product Code	ACFT 031N, ACFT 033N.
Unit Sizes:	1322MM X 2382MM	**Glazing Clip**	
Glazing Tape Details		Manufacturer:	NA
Manufacturer:	NA	Product Name:	
Product Name:		Product Code	
Product Code			

Hardware			**Fixings**	**Quantity**
Hinges:	ACINS26.		ACET070, ACET099	2
Hinge Protectors:	ACET516		ACET060	2 PRS.
Lock:	ACEF956		ACET060	1
Cylinder:				
Handle:	ACET868		HEA132SSZ.	2
Touch Bar:				
Cylinder Support:				
Cylinder Escutcheon:				
Keeps:				
Drip Bar				
Additional Hardware	ACEF980	RUN UP BLOCKS	ACET060	2
	ACGSL 045	DRAIN CAPS		2
	ACSIL04	SEALANT		
	ACSIL013	CLEAT GLUE		

Eco Futural Side Hung Next To Fixed.(continued)

Outer Frame width	2421MM	**Outer Frame Material**	ALUMINIUM
Outer Frame height	1440MM	**Outer Frame Gasket**	
Outer Frame Part Numbers		Gasket Type	EDPM
Top	EF110	Manufacturer	EBP
Bottom	EF110	Product Name	ECO FUTURAL
Lock Side	EF110	Product Code	ACVL032
Hinge Side	EF110	**Threshold**	
Outer Frame section dimensions		Manufacturer	
Width	50MM	Product name	
Depth	65MM	Product Code	
REVERSE ADAPTOR		Materials	
Manufacturer	SMART SYSTEMS	**Outer Frame Joint Method**	
Product Name	ECO FUTURAL	Head	CRIMPED, GLUED, SEALED
Product code	EF945	Foot	
Material	ALUMINIUM		

Leaf		**Leaf Material:**	ALUMINIUM
Leaf Width:	848MM	**Leaf Gasket**	
Leaf Height:	1345MM	Gasket type:	EDPM
Leaf Part Numbers:		Manufacturer:	EBP
Top:	EF926	Product Name:	ECO FUTURAL
Bottom:	EF926	Product Code	ACVL032
Lock side:	EF926	**Leaf Midrail:**	
Hinge Side	EF926	Manufacturer:	
Leaf section size		Product name:	
Width:	74MM	Product code:	
Depth:	65MM	Material:	
MULLION		**Leaf joint method**	
Manufacturer:	SMART SYSTEMS	Head:	CRIMPED, GLUED, SEALED
Product Name:	ECO FUTURAL	Foot:	
Product Code:	EF030		
Material:	ALUMINIUM		
Bead			
Manufacturer:	SMART SYSTEMS		
Product Name:	ECO FUTURAL		
Product Code:	GL526		
Material:	ALUMINIUM		
Bead Size:	22MM X 26MM		

Eco Futural Side Hung Next To Fixed. (continued)

Glazing Unit		**Glazing Gasket**	
Manufacturer:	MACROE GLASS	Gasket Type:	EDPM
Inner Thickness:	6MM TOUGHENED	Manufacturer:	SEMPERIT PROFILES
Spacer Material:	16MM ALUMINIUM	Product Name:	ECO FUTURAL
Outer Thickness:	6MM TOUGHENED	Product Code	ACFT031N, ACFT033N.
Unit Sizes:	720MM X 1227MM.	**Glazing Clip**	NA.
Glazing Tape Details		Manufacturer:	
Manufacturer:	NA	Product Name:	
Product Name:		Product Code	
Product Code			

Hardware			**Fixings**	**Quantity**
Hinges:	ACINSSH16		ACET070,ACET099.	1PAIR
Hinge Protectors:	ACET516		ACET060	2 PAIRS
Lock:	ACET956		ACET060	1
Cylinder:				
Handle:	ACET868		HEA132SSZ.	1
Touch Bar:				
Cylinder Support:				
Cylinder Escutcheon:				
Keeps:	ACEF956		ACET060,ACET390	4
Drip Bar				
Additional Hardware	ACEF980	RUN UP BLOCKS		4
	ACVG45	DRAIN CAPS		4
	MULLION ANTI-TWIST CLIP			2
	ACSIL04	SEALANT		
	ACSIL013	CLEAT GLUE		
	ACMX09830	GASKET SEALANT		

BS4873:2009 Weather Type.

Product Description.

1 off projecting side hung next to projecting side hung window (Sample 1)

1 off projecting top hung window (Sample 2)

1 off projecting side hung next to fixed window (Sample 3)

(Equipment Record No: 10158566)

Date samples received: 10 December 2015

Summary of Results.

1. Air permeability — Test samples 1 and 3 met the requirements of the Specification, in respect of Clause 6, for Test Pressure Class 4.

   Test sample 2 met the requirements of the Specification, in respect of Clause 6, for Test Pressure Class 2.

2. Watertightness — Test samples 1 and 3 met the requirements of the Specification, in respect of Clause 7, for test Pressure Class E1050.

   Test sample 2 met the requirements of the Specification, in respect of Clause 7, for test Pressure Class 8A.

3. Wind resistance — Test samples 1 and 3 met the requirements of the Specification, in respect of Clause 8, for Exposure Category Class AE.

   Test sample 2 met the requirements of the Specification, in respect of Clause 8, for Exposure Category Class A5.

Classification for Wind Resistance.

Test samples 1 and 3	Exposure Category 2400Pa
Test sample 2	Exposure Category 2000Pa

4. Operation and Strength — Test sample 1 met the requirements of the Specification in respect of BS 6375-2

Classification for Operational Strength.

Operating forces	Class 1
Resistance to Static torsion	Class 2
Racking	Class 2
Load bearing	Not fitted
Impact resistance	Class 0
Repeated opening and closing (Sample 2)	10,000 cycles complete

5. Basic security — The test samples met the requirements of BS6375-3

Sample Selection.

The sample submitted for tests were selected using the PCP Scheme Document Specification.
The sample was submitted for test mounted in a 50mm x 100mm timber subframe in accordance with the manufacturer's installation requirements. Sample manufactured by the client.

Clause 5 Sequence of Tests.

The sequence of testing the sample followed that detailed in Clause 5 of BS 6375-1:2015.

Clause 5 Performance Requirements.

The performance of the sample was assessed against the requirements detailed in
Table 1 Exposure categories and classifications

Method of Test.

The samples were prepared as required by BS EN 1026:2000 Windows and doors - Air permeability, BS EN 1027:2000 Windows and doors - Watertightness and BS EN 12211:2000 Windows and doors - Resistance to wind load in respect of BS 6375 -1:2015.The samples were mounted into a plywood surround for installation in the test apparatus.
The joint between the samples and the plywood surround was sealed.
The sample was manufactured by the client

1. Air permeability

The air permeability of the samples was determined by the method given in BS EN 1026:2000.

2. Watertightness

The watertightness of the samples was determined by the method given in BS EN 1027:2000.

3. Resistance to wind load (P1 and P2)

The resistance to wind load of the samples was determined by the method given in BS EN 12211:2000.

4. Repeat test

After testing for resistance to wind load test 1 (air permeability) was repeated

5. Resistance to wind load (P3)

The resistance to wind load of the samples was determined by the method given in BS EN 12211:2000.

6. Operational strength

The operational strength characteristics were determined by the method given in BS 6375-2:2009.

7. Basic security

The basic security test method was determined by the method given in BS6375-3

8. Repeated opening and closing

The repeated opening and closing was carried out using the method given in standard BS EN 1191.

Note.

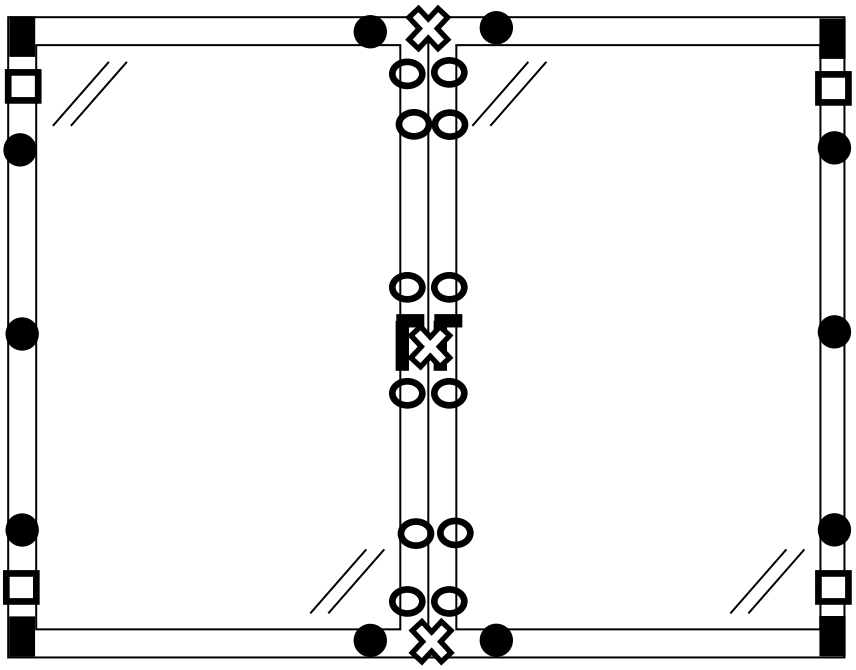
Repeated Opening and Closing not UKAS accredited to BS6375-2

Basic Security not UKAS accredited to BS6375-3

Description of Sample. (Sample 1)

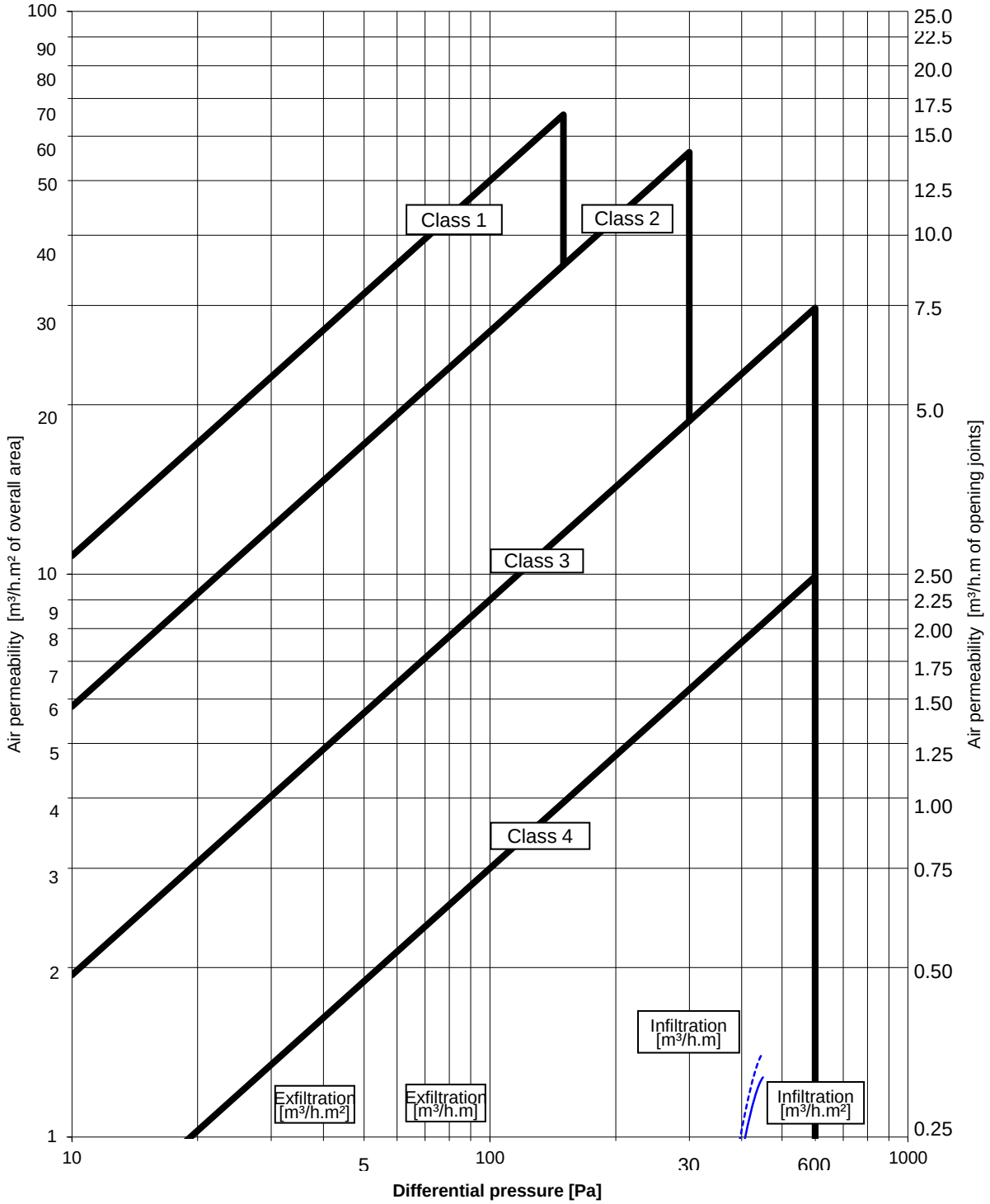
Manufacturer -	Smart Systems	
Window type -	Projecting side hung next to projecting side hung	
Material -	Aluminium	
Finish -	White	
Construction -	Outerframe: Sash:	Cleated Cleated
Fittings (Each sash) -	Hinge: Locking:	16” Securistyle side hung stays A six point locking (six mushroom bolt) ERA locking system operated by a key locking handle 5 off run up blocks 2 of pairs of Vector hinge protectors
Glass -	Double glazed, 6-18-6mm toughened glass sealed units	
Glazing system -	Internal beads and gaskets	
Sample dimensions -	For information only (nominal sizes) Overall size Length: 1730mm Height: 1440mm Each sash size Length: 840mm Height: 1410mm	
Date of test -	16 December 2015	
Laboratory temperature -	18.6°C	
Laboratory humidity -	48.4%	
Atmospheric pressure:	100.1kPa	

Elevation Drawing Showing Position of Hardware.



- Hinge
- Hinge Protector
- Mushroom Bolt
- Handle
- transducer
- Run Up Block

Graph of Air Permeability Before Gusting.



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Table of Average Air Permeability Before Gusting.

Clause 6 Before resistance to wind tests

Three positive pressure pulses of 660Pa were applied prior to testing

Table 4

Air Pressure [Pa]	Average rate of air leakage [m³/h]	Average rate of air leakage per meter length of opening joint [m³/h.m]	Average rate of air leakage relative to area of sample [m³/h.m²]
50	0.6	0.07	0.24
100	0.8	0.09	0.34
150	0.8	0.09	0.34
200	0.4	0.05	0.18
250	0.9	0.10	0.36
300	1.3	0.14	0.52
450	2.5	0.28	1.00
600	1.0	0.11	0.40

Note: The figures in the table above give the leakage as an average of the leakage at positive pressure and the leakage at negative pressure

Total opening perimeter = 9m

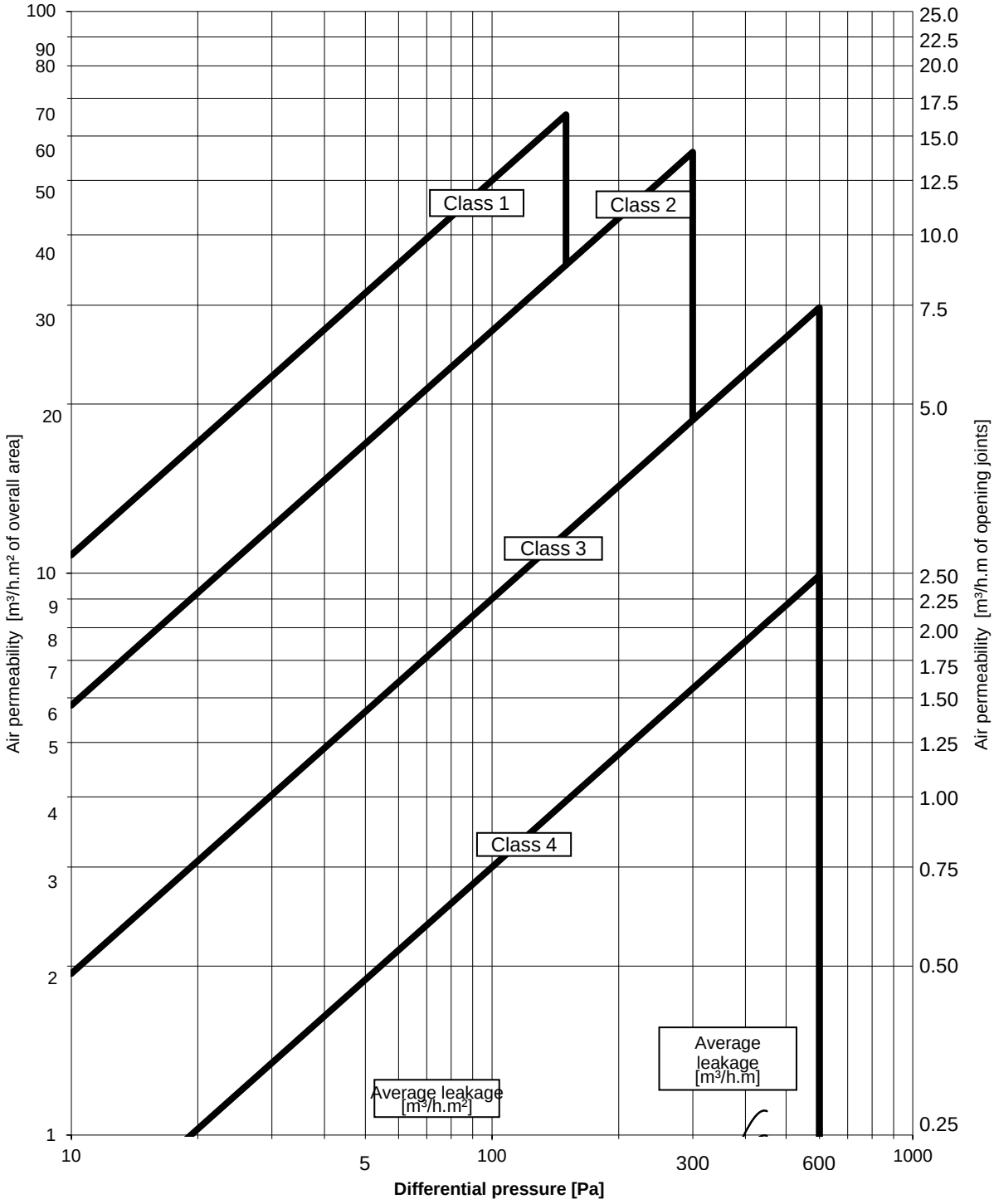
Overall area = 2.49m²

BS 6375-1:2015 Clause 6.2 - Joint class = 4

BS 6375-1:2015 Clause 6.2 - Area class = 4

BS 6375-1:2015 Clause 6.2 - Overall class = 4

Graph of Average Air Permeability Before Gusting.



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Water Tightness Test Results.

BS EN 1027:2000 Clause 7 Watertightness before resistance to wind loads

TABLE 2 - Spraying method 1A

Pressure (Pascals)	Point and time at which water leakage occurred
0	No Leakage
50	No Leakage
100	No Leakage
150	No Leakage
200	No Leakage
250	No Leakage
300	No Leakage
450	No Leakage
600	No Leakage
750	No Leakage
900	No Leakage
1050	No Leakage

Wind Resistance Test Results - BS EN 12211:2000.

Clause 8 Resistance to wind load

P1 DEFLECTION TEST

Three positive pressure pulses at 2640Pa were applied

No visible failures or functional defects to the sample were observed after wind loads applied at a positive pressure of 2400Pa

Actual deflection – 0.90mm (maximum deflection allowed 8.26mm)

Deflection/span ratio 1/1377 (maximum ratio allowed 1/150)

Three negative pressure pulses at 2640Pa were applied

No visible failures or functional defects to the sample were observed after wind loads applied at a negative pressure of 2400Pa

Actual deflection – 1.58mm (maximum deflection allowed 8.26mm)

Deflection/span ratio 1/784 (maximum ratio allowed 1/150)

Wind Resistance Test Results - BS EN 12211:2000. (Continued)

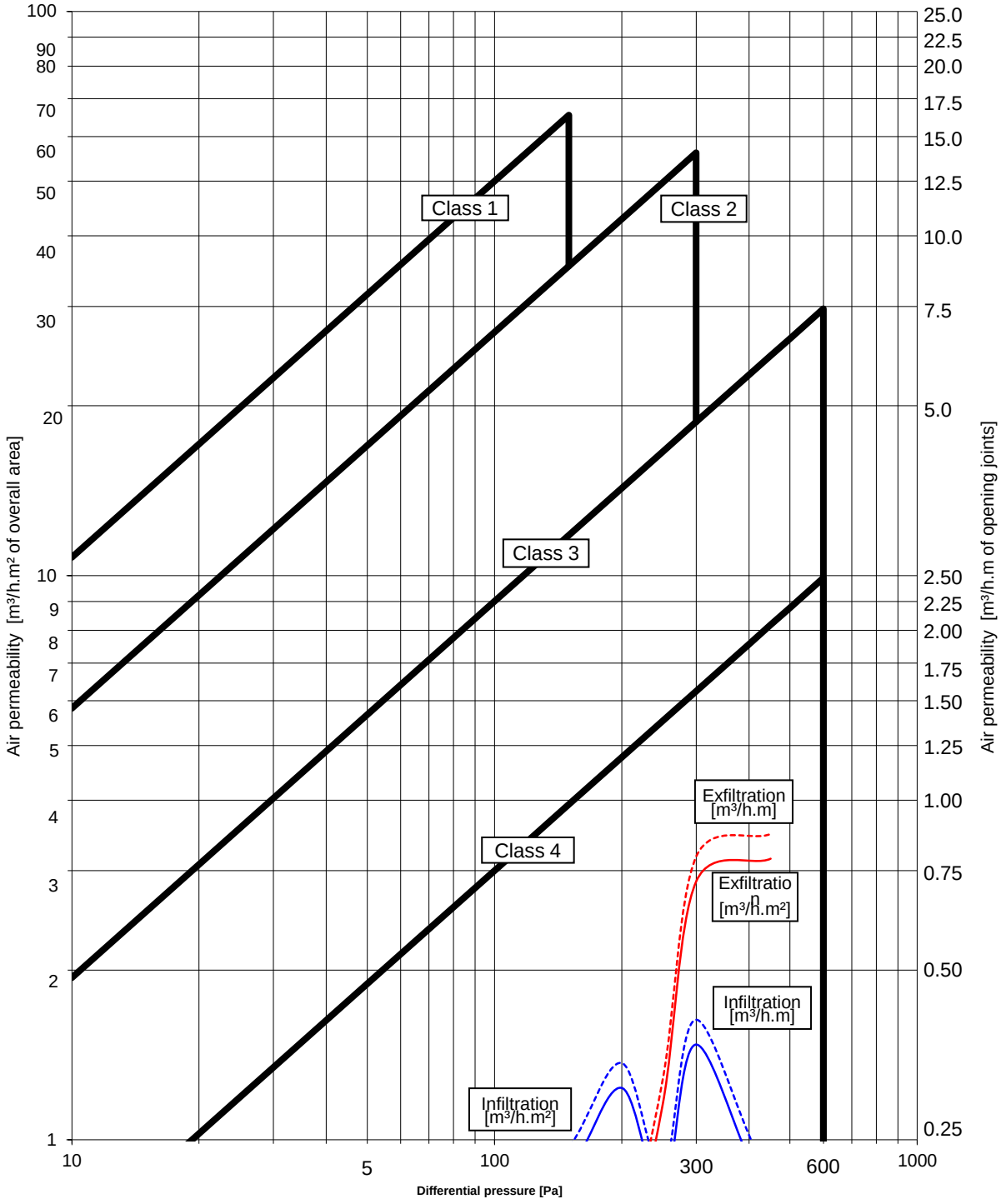
P2 REPEATED PRESSURE TEST

No visible failures or functional defects to the sample were observed after 50 cycles of repeated wind loads applied at a positive pressure of 1200Pa

No visible failures or functional defects to the sample were observed after 50 cycles of repeated wind loads applied at a negative pressure of 1200Pa

In accordance with BS 6375-1:2015 Clause 6.5, as the classification after the resistance to wind load tests is the same as the classification before the resistance to wind load tests, the resulting classification for the sample is Class 2.

Graph of Air Permeability After Gusting.



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Table of Average Air Permeability After Gusting.

Clause 6 After resistance to wind tests

Three positive pressure pulses of 660Pa were applied prior to testing

Table 4

Air Pressure [Pa]	Average rate of air leakage [m³/h]	Average rate of air leakage per meter length of opening joint [m³/h.m]	Average rate of air leakage relative to area of sample [m³/h.m²]
50	1.1	0.13	0.46
100	0.9	0.10	0.38
150	1.5	0.17	0.60
200	2.2	0.25	0.90
250	2.4	0.27	0.98
300	5.4	0.60	2.17
450	4.9	0.55	1.97
600	6.1	0.67	2.43

Note: The figures in the table above give the leakage as an average of the leakage at positive pressure and the leakage at negative pressure

Total opening perimeter = 9m

Overall area = 2.49m²

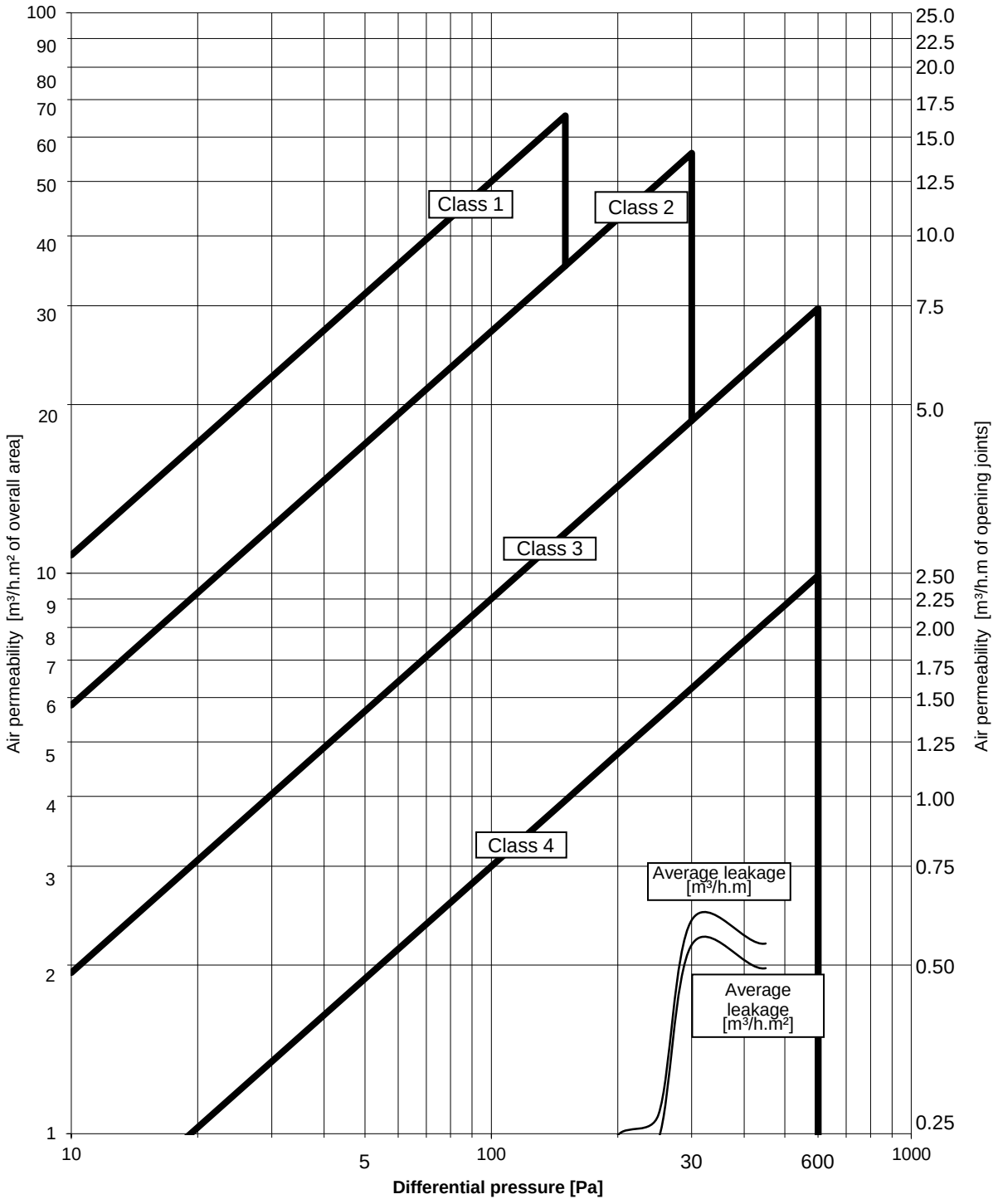
BS 6375-1:2015 Clause 6.5 - Joint class = 4

BS 6375-1:2015 Clause 6.5 - Area class = 4

BS 6375-1:2015 Clause 6.5 - Overall class = 4

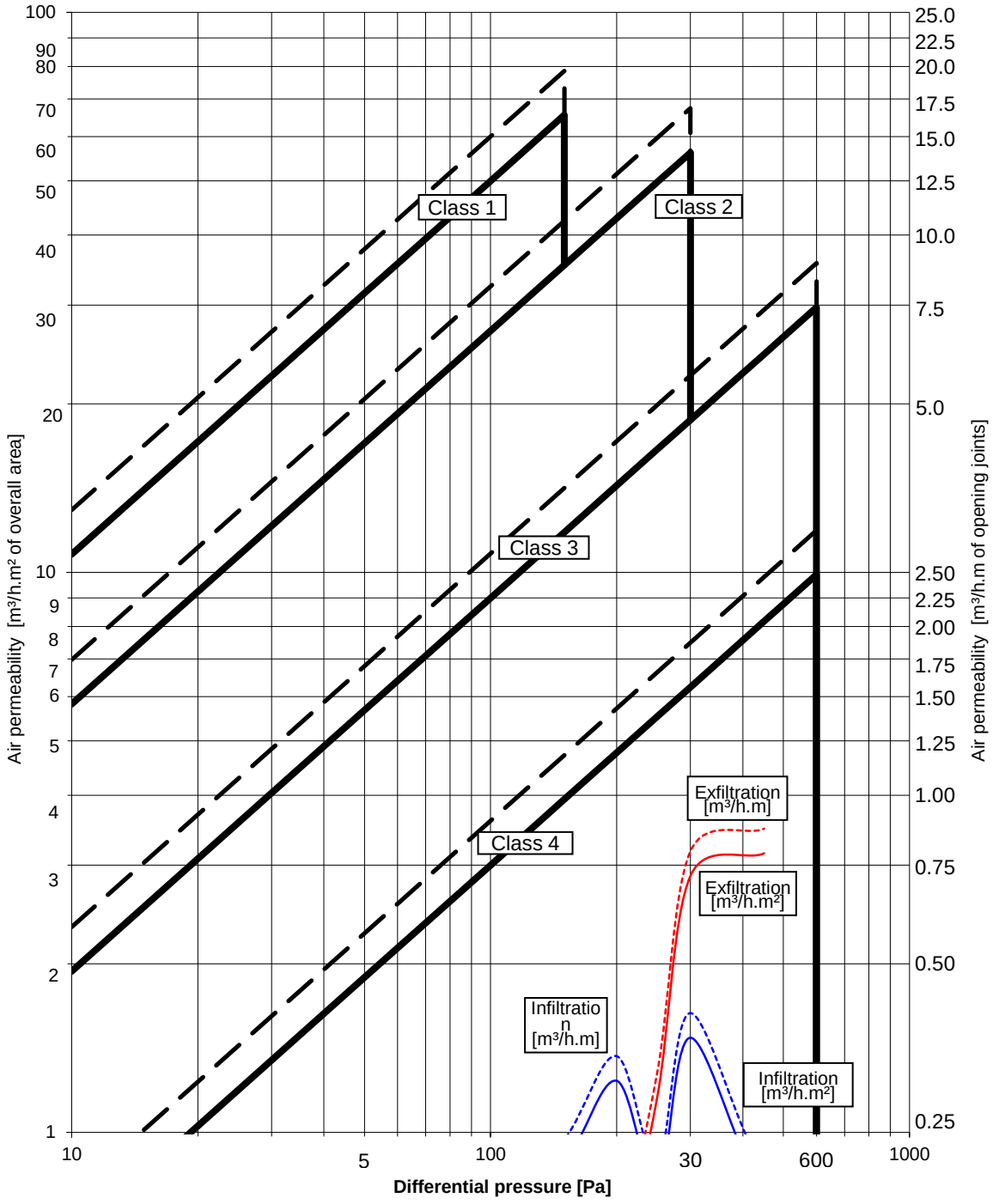
In accordance with BS 6375-1:2015 Clause 6.5, as the classification after the resistance to wind load tests is the same as the classification before the resistance to wind load tests, the resulting classification for the sample is Class 4.

Average Graph of Air Permeability After Gusting.



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Average Graph of Air Permeability After Gusting Including +20% Lines For Each Class.



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Wind Load Resistance Test Results - BS EN 12211:2000.

P3 SAFETY TEST

No parts of the test sample became detached and the test sample remained closed after a wind load safety test applied at a positive air pressure of 3600Pa.

No parts of the test sample became detached and the test sample remained closed after a wind load safety test applied at a negative air pressure of 3600Pa.

Operation and Strength.

(BS 6375-2:2009)

Clause 5 Performance characteristics and requirements for windows **Assessment**

Clause 5.1 Operating Forces: EN13115 and EN12046

The sample was tested three times; operating the key, handle opening, sash closing, handle closing, then key to lock, and average of the three results were then recorded.

Key Unlock – 0.10Nm (maximum 5Nm)	Pass
Handle opening – 40.20N (maximum 100N)	Pass
Sash opening – 30.50N (maximum 100N)	Pass
Sash closing – 26.60N (maximum 100N)	Pass
Handle closing – 26.85N (maximum 100N)	Pass
Key lock – 0.25Nm (maximum 5Nm)	Pass

Clause 5 Performance characteristics and requirements for windows

Clause 5.2.1 Resistance to static torsion BS EN 14609 and BS EN 13115

The sample was open and closed 5 times before the test; all loads were applied in accordance with BS EN 14609:2004, maximum increments of 100N in minimum 1 second intervals.

The window was opened 90° or its maximum opening position and blocked, and the 30N pre load applied for 60 seconds.

300(N) was applied in 1second min intervals, for 5 minutes, measuring the max deformation and finally the Residual deformation after 1 min rest

Maximum deformation – 45.50mm

Residual deformation – 1.15mm

After Resistance to static torsion the Performance characteristics were tested again

Operation and Strength.

(BS 6375-2:2009)

Clause 5 Performance characteristics and requirements for windows	**Assessment**

Clause 5.1 Operating Forces: EN13115 and EN12046
The sample was tested three times, operating the key, handle opening, sash closing, handle closing, then key to lock, and average of the three results were then recorded.

Key Unlock – 0.25Nm (maximum 5Nm)	Pass
Handle opening – 42.65N (maximum 100N)	Pass
Sash opening – 31.10N (maximum 100N)	Pass
Sash closing – 32.45N (maximum 100N)	Pass
Handle closing – 26.50N (maximum 100N)	Pass
Key lock – 0.30Nm (maximum 5Nm)	Pass

Clause 5.2.2 Racking BS EN 14608 and BS EN 13115

The sample was opened and closed 5 times before the test, the loads were applied in accordance with BS EN 14608:2004, maximum increments of 100N in minimum 1 second intervals.

The window was opened at an angle of 90° or its maximum opening position, and a 60N pre load was applied for 60 second.

600(N) was applied in 1second min intervals for 5 minutes, measuring the max deformation, then finally the Residual deformation after 1 min rest.

Maximum deformation – 21.00mm

Residual deformation – 1.00mm

Operation and Strength.

(BS 6375-2:2009)

Clause 5 Performance characteristics and requirements for windows **Assessment**

Clause 5.1 Operating Forces: EN13115 and EN12046

After Resistance to static torsion the Performance characteristics were tested again.

The sample was tested three times, operating the key, handle opening, sash closing, handle closing, then key to lock, and average of the three results were then recorded.

Key Unlock – 0.30Nm (maximum 5Nm)	Pass
Handle opening – 45.50N (maximum 100N)	Pass
Sash opening – 33.60N (maximum 100N)	Pass
Sash closing – 34.65N (maximum 100N)	Pass
Handle closing – 26.90N (maximum 100N)	Pass
Key lock – 0.30Nm (maximum 5Nm)	Pass

Clause 5.3 Load bearing capacity of safety devices

Not applicable

Clause 5.4 Impact resistance BS EN 13049 and BS EN 13115

The sample was opened and closed 5 times before the test, the testing was carried out accordance with BS EN 13049.

The BS EN 12600 Impactor was used for the impact, and only one impact was carried out on one sample.

The maximum particle weight of any part of the sample that comes away may not be more than 50g, the sash, casement, hardware or infill retaining components may not disconnect, or become dislodged in a dangerous manner.

Impact height achieved: 200mm

Direction of impact: From outside

Point of impact: Centre of sample

Details of damage: None Pass

Basic security (Annex A).
BS 6375: Part 3: 2009 - Performance of Windows.

The objective of this test is to establish from if from the outside entry can be gained by defeating the glazing or locking system.

The force used did not result in permanent set or plastic deformation of any tool.

Damaged tools shall be replaced and the test did not exceed the maximum 3 minute time period.

The screwdriver was used to no effect

No entry could be effected Pass

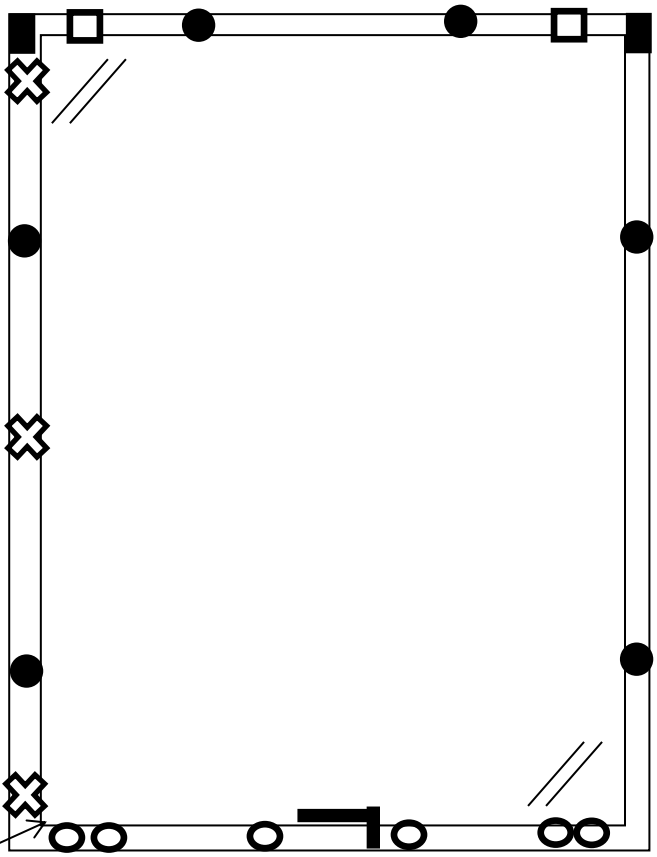
Photograph of Sample.(sample 1)



Description of Sample. (Sample 2)

Manufacturer -	Smart Systems	
Window type -	Projecting top hung	
Material -	Aluminium	
Finish -	White	
Construction -	Outerframe:	Cleated
	Sash:	Cleated
Fittings -	Hinge:	22" Securistyle top hung stays
	Locking:	A six point locking (six mushroom bolt) ERA locking system operated by a key locking handle 6 off run up blocks 2 of pairs of Vector hinge protectors
Glass -	Double glazed, 6-18-6mm toughened glass sealed unit	
Glazing system -	Internal beads and gaskets	
Sample dimensions -	For information only (nominal sizes)	
	Overall size Length: 1480mm Height: 2530mm	
	Sash size Length: 1440mm Height: 2500mm	
Date of test -	18 December 2015	
Laboratory temperature -	19.2°C	
Laboratory humidity -	45.6%	
Atmospheric pressure:	100.3kPa	

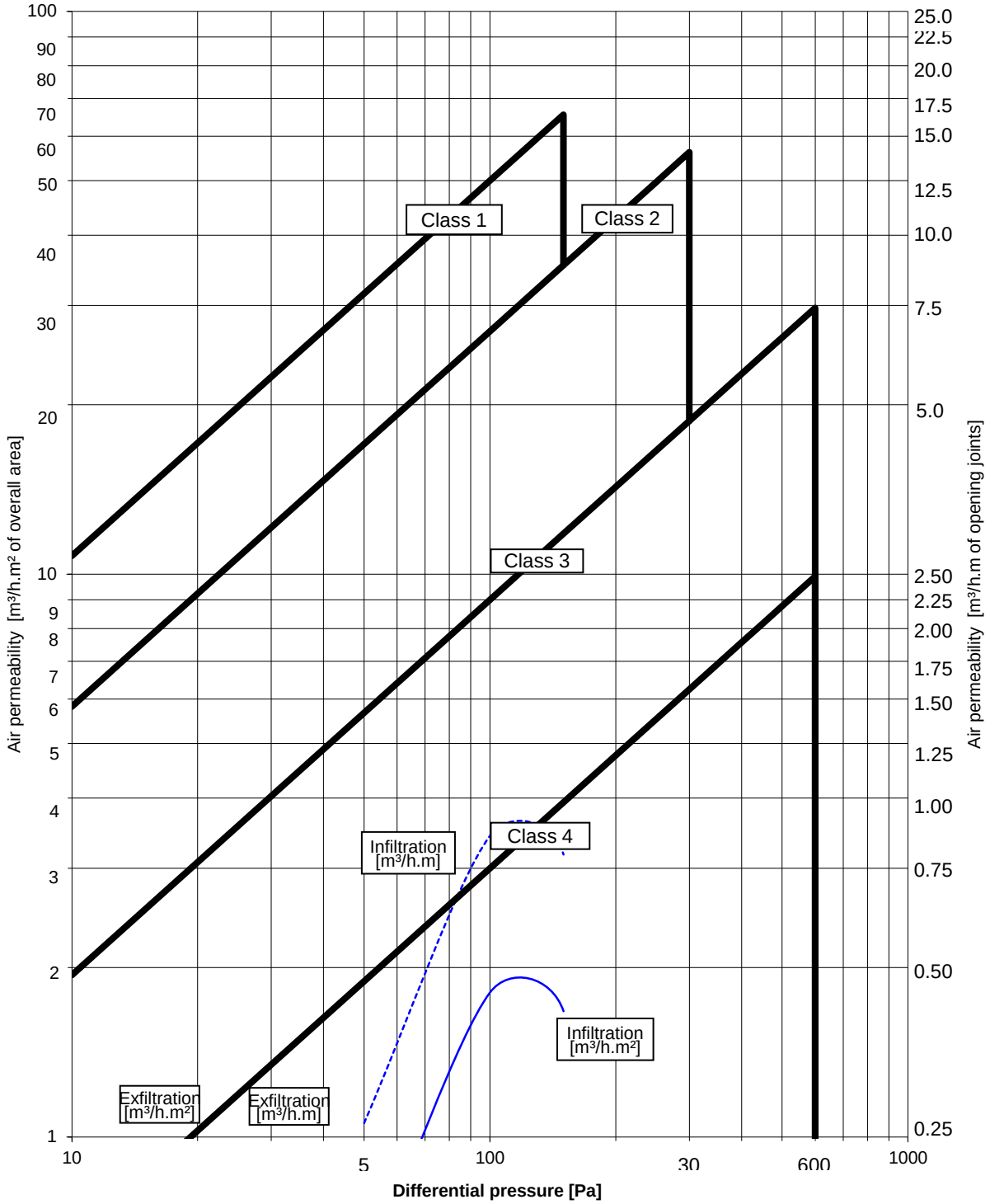
Elevation Drawing Showing Position of Hardware.



Water Leakage

- Hinge
- Hinge Protector
- Mushroom Bolt
- Handle
- transducer
- Run Up Block

Graph of Air Permeability Before Gusting.



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Table of Average Air Permeability Before Gusting.

Clause 6 Before resistance to wind tests

Three positive pressure pulses of 660Pa were applied prior to testing

Table 4

Air Pressure [Pa]	Average rate of air leakage [m³/h]	Average rate of air leakage per meter length of opening joint [m³/h.m]	Average rate of air leakage relative to area of sample [m³/h.m²]
50	1.0	0.13	0.28
100	4.6	0.58	1.22
150	3.1	0.40	0.84
200	15.8	2.00	4.22
250	39.8	5.05	10.65
300	-	-	-
450	-	-	-
600	-	-	-

Note: The figures in the table above give the leakage as an average of the leakage at positive pressure and the leakage at negative pressure

Total opening perimeter = 7.88m

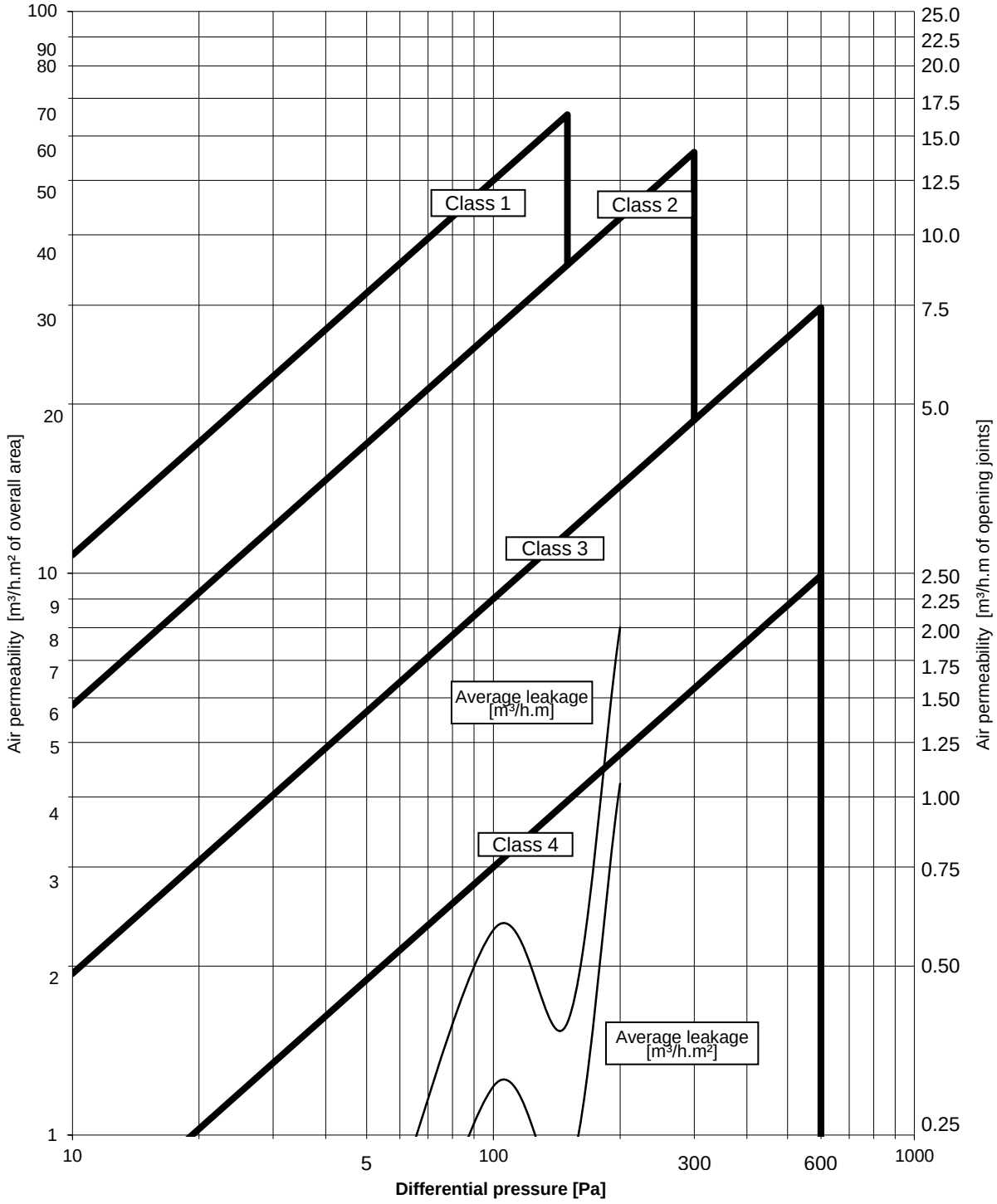
Overall area = 3.74m²

BS 6375-1:2015 Clause 6.2 - Joint class = 2

BS 6375-1:2015 Clause 6.2 - Area class = 2

BS 6375-1:2015 Clause 6.2 - Overall class = 2

Graph of Average Air Permeability Before Gusting.



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Water Tightness Test Results.

BS EN 1027:2000 Clause 7 Watertightness before resistance to wind loads

TABLE 2 - Spraying method 1A

Pressure (Pascals)	Point and time at which water leakage occurred
0	No Leakage
50	No Leakage
100	No Leakage
150	No Leakage
200	No Leakage
250	No Leakage
300	No Leakage
450	No Leakage
600	Water leaked from sill opening joint at 2 minutes 31 seconds.
750	-
900	-
1050	-

Wind Resistance Test Results - BS EN 12211:2000.

Clause 8 Resistance to wind load

P1 DEFLECTION TEST

Three positive pressure pulses at 2200Pa were applied

No visible failures or functional defects to the sample were observed after wind loads applied at a positive pressure of 2000Pa

Actual deflection – 12.54mm (maximum deflection allowed 16.10mm)

Deflection/span ratio 1/192 (maximum ratio allowed 1/150)

Three negative pressure pulses at 2200Pa were applied

No visible failures or functional defects to the sample were observed after wind loads applied at a negative pressure of 2000Pa

Actual deflection – 16.08mm (maximum deflection allowed 16.10mm)

Deflection/span ratio 1/150 (maximum ratio allowed 1/150)

Wind Resistance Test Results - BS EN 12211:2000. (Continued)

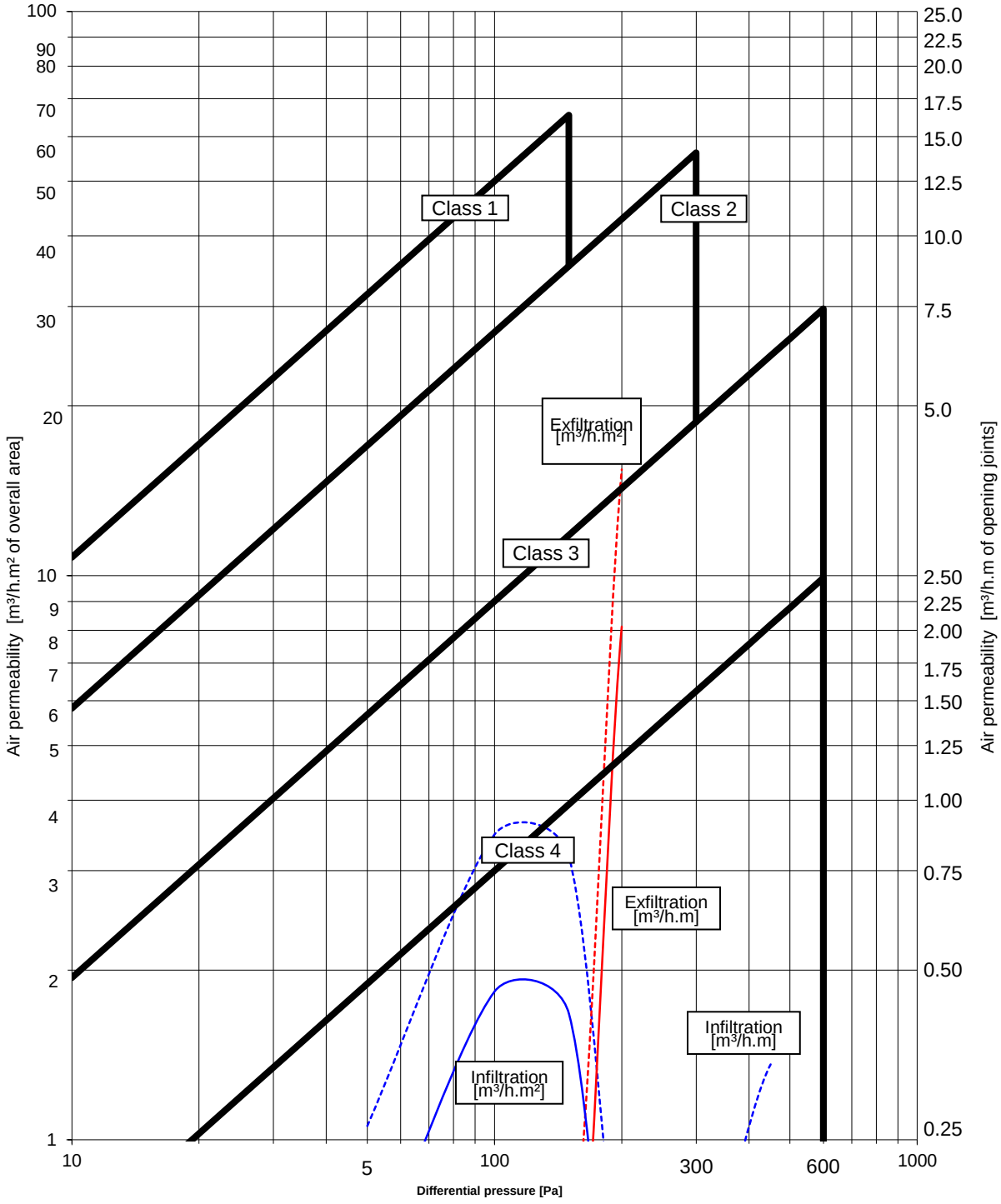
P2 REPEATED PRESSURE TEST

No visible failures or functional defects to the sample were observed after 50 cycles of repeated wind loads applied at a positive pressure of 1000Pa

No visible failures or functional defects to the sample were observed after 50 cycles of repeated wind loads applied at a negative pressure of 1000Pa

In accordance with BS 6375-1:2015 Clause 6.5, as the classification after the resistance to wind load tests is the same as the classification before the resistance to wind load tests, the resulting classification for the sample is Class 2.

Graph of Air Permeability After Gusting.



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Table of Average Air Permeability After Gusting.

Clause 6 After resistance to wind tests

Three positive pressure pulses of 660Pa were applied prior to testing

Table 4

Air Pressure [Pa]	Average rate of air leakage [m³/h]	Average rate of air leakage per meter length of opening joint [m³/h.m]	Average rate of air leakage relative to area of sample [m³/h.m²]
50	1.3	0.17	0.36
100	4.4	0.55	1.17
150	3.7	0.47	0.98
200	15.7	1.99	4.19
250	38.8	4.92	10.37
300	-	-	-
450	-	-	-
600	-	-	-

Note: The figures in the table above give the leakage as an average of the leakage at positive pressure and the leakage at negative pressure

Total opening perimeter = 7.88m

Overall area = 3.74m²

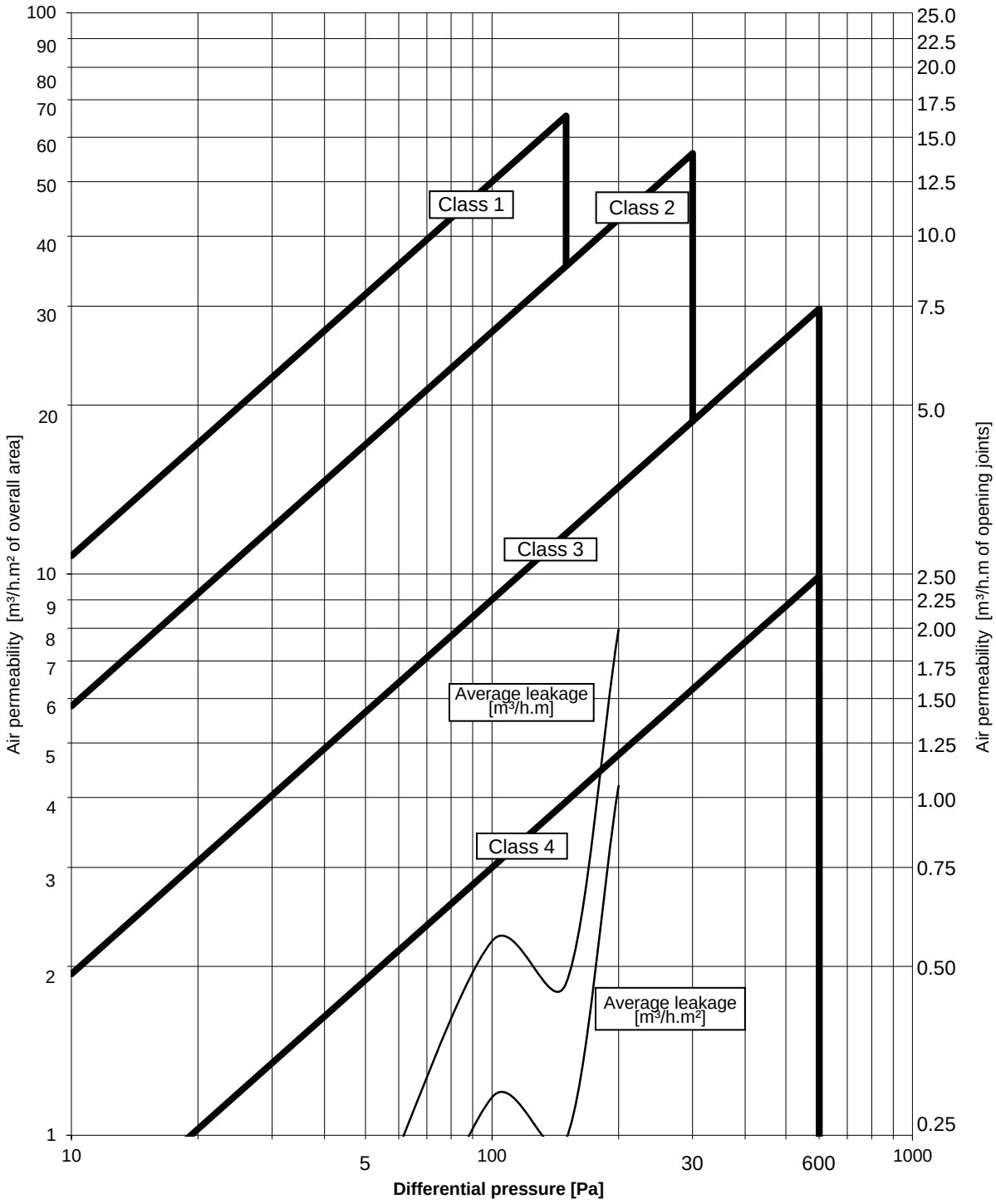
BS 6375-1:2015 Clause 6.5 - Joint class = 2

BS 6375-1:2015 Clause 6.5 - Area class = 2

BS 6375-1:2015 Clause 6.5 - Overall class = 2

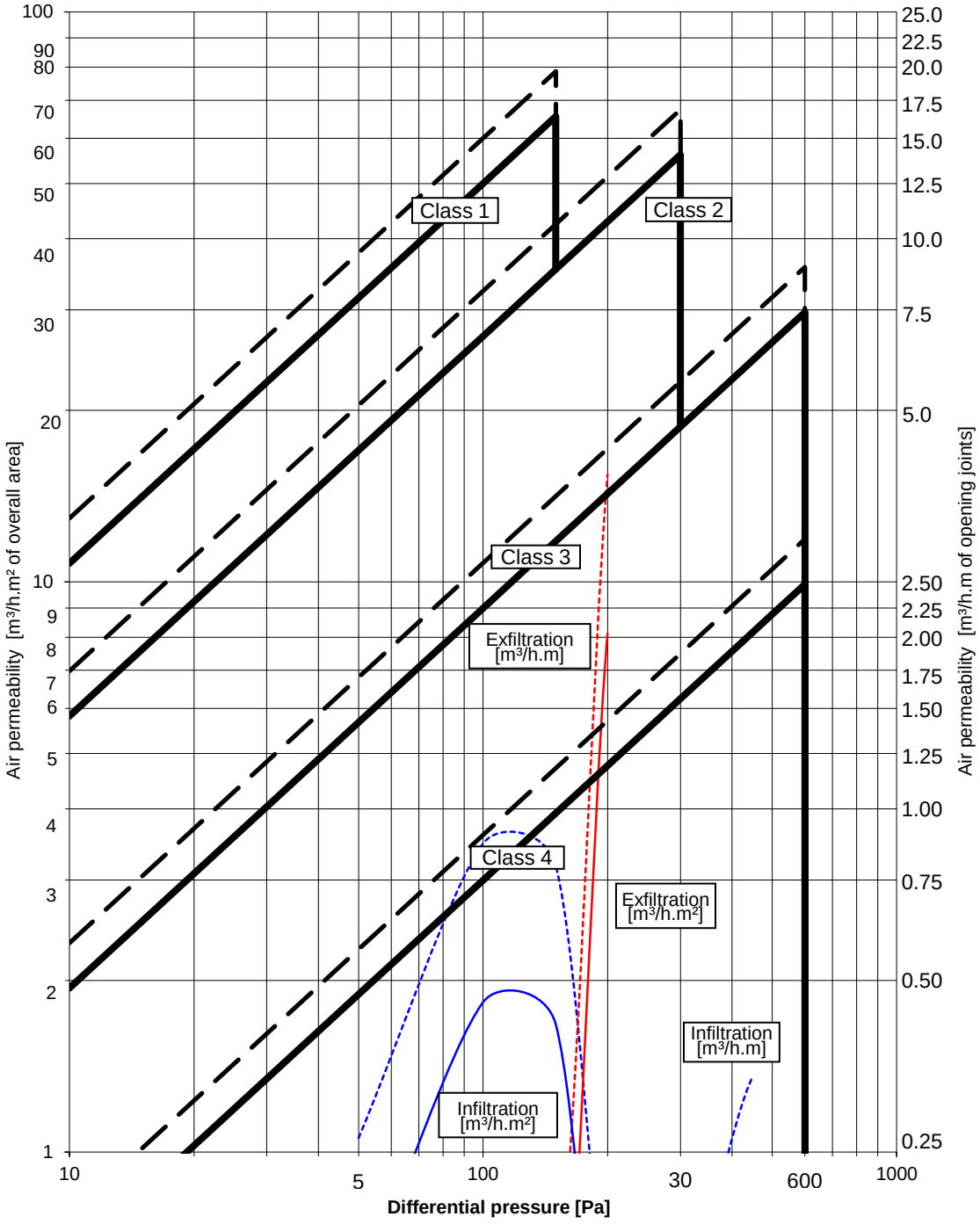
In accordance with BS 6375-1:2015 Clause 6.5, as the classification after the resistance to wind load tests is the same as the classification before the resistance to wind load tests, the resulting classification for the sample is Class 2.

Graph of Average Air Permeability After Gusting.



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Average Graph of Air Permeability After Gusting Including +20% Lines For Each Class.



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Wind Load Resistance Test Results - BS EN 12211:2000.

P3 SAFETY TEST

No parts of the test sample became detached and the test sample remained closed after a wind load safety test applied at a positive air pressure of 3000Pa.

No parts of the test sample became detached and the test sample remained closed after a wind load safety test applied at a negative air pressure of 3000Pa.

Basic security (Annex A).
BS 6375: Part 3: 2009 - Performance of Windows.

The objective of this test is to establish from if from the outside entry can be gained by defeating the glazing or locking system.

The force used did not result in permanent set or plastic deformation of any tool.

Damaged tools shall be replaced and the test did not exceed the maximum 3 minute time period.

The screwdriver was used to no effect

No entry could be effected Pass

BS EN 1191:2012. (Sample 2)

Clause 5 Performance characteristics and requirements for windows **Assessment**

Clause 5.5 Repeated opening and closing

The sample was opened and closed 5 times before testing started
A procedure was followed

Key rotation of key to unlock: 90 degrees

Clause 6.2 Operating Forces: EN12046-1 and EN12217 (pre-test operation)

The sample was tested three times, unlocking the key, handle opening force, sash opening force, sash closing force, handle closing force, key force to lock, and average of the three results were then recorded.

Active sash tested for 10,000 cycles

Key toque to unlock – 0.78Nm (maximum 20Nm)	Pass
Handle opening force – 20.35N (maximum 100N)	Pass
Sash opening force – 61.80N (maximum 100N)	Pass
Sash closing force – 23.40N (maximum 100N)	Pass
Handle closing force – 42.45N (maximum 100N)	Pass
Key toque to unlock – 0.66Nm (maximum 20Nm)	Pass

Key torque to unlock – 0.78Nm (maximum 50Nm)	Pass
Handle opening force – 20.90N (maximum 100N)	Pass
Sash opening force – 59.60N (maximum 100N)	Pass
Sash closing force – 25.95N (maximum 100N)	Pass
Handle closing force – 44.50N (maximum 100N)	Pass
Key toque to unlock – 0.72Nm (maximum 50Nm)	Pass

At 100% of the complete cycles the Operating forces were taken again

The sample met the requirements of the standard and remained within the forces for 10,000 cycles

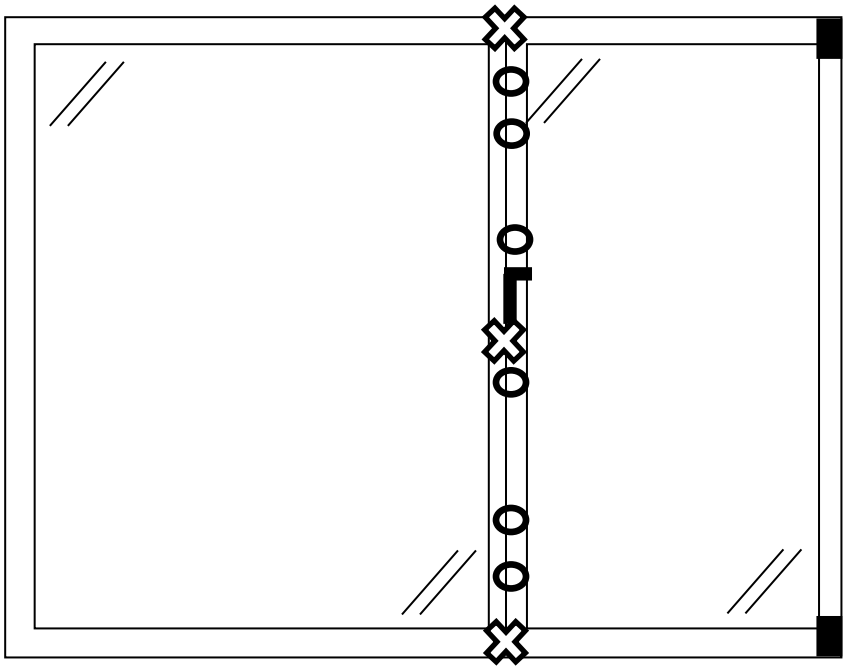
Photograph of Sample.(sample 2)



Description of Sample. (Sample 3)

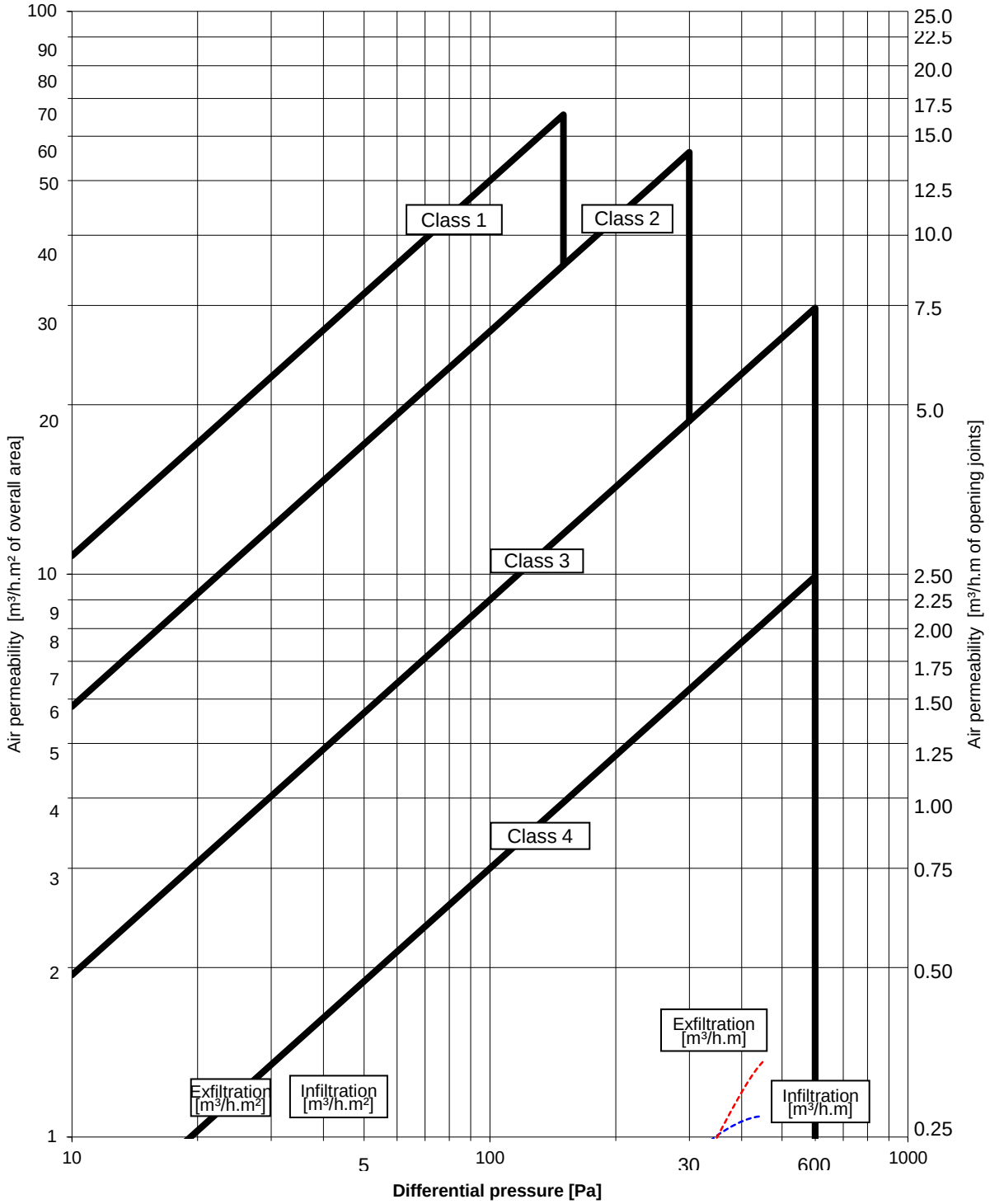
Manufacturer -	Smart Systems	
Window type -	Projecting side hung next to fixed window	
Material -	Aluminium	
Finish -	White	
Construction -	Outerframe: Sash:	Cleated Cleated
Fittings -	Hinge: Locking:	16” Securistyle side hung stays A six point locking (six mushroom bolt) ERA locking system operated by a key locking handle
Glass -	Double glazed, 6-18-6mm toughened glass sealed unit	
Glazing system -	Internal beads and gaskets	
Sample dimensions -	For information only (nominal sizes)	
	Overall size Length: 2400mm Height: 1405mm	
	Sash size Length: 840mm Height: 1345mm	
Date of test -	19 December 2015	
Laboratory temperature -	18.6°C	
Laboratory humidity -	44.7%	
Atmospheric pressure:	99.9kPa	

Elevation Drawing Showing Position of Hardware.



- Hinge
- Mushroom Bolt
- Handle
- transducer

Graph of Air Permeability Before Gusting.



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Table of Average Air Permeability Before Gusting.

Clause 6 Before resistance to wind tests

Three positive pressure pulses of 660Pa were applied prior to testing

Table 4

Air Pressure [Pa]	Average rate of air leakage [m³/h]	Average rate of air leakage per meter length of opening joint [m³/h.m]	Average rate of air leakage relative to area of sample [m³/h.m²]
50	0.4	0.10	0.13
100	0.6	0.14	0.18
150	0.7	0.16	0.21
200	0.7	0.17	0.22
250	0.7	0.17	0.22
300	0.9	0.22	0.28
450	1.3	0.31	0.40
600	1.2	0.28	0.37

Note: The figures in the table above give the leakage as an average of the leakage at positive pressure and the leakage at negative pressure

Total opening perimeter = 4.37m

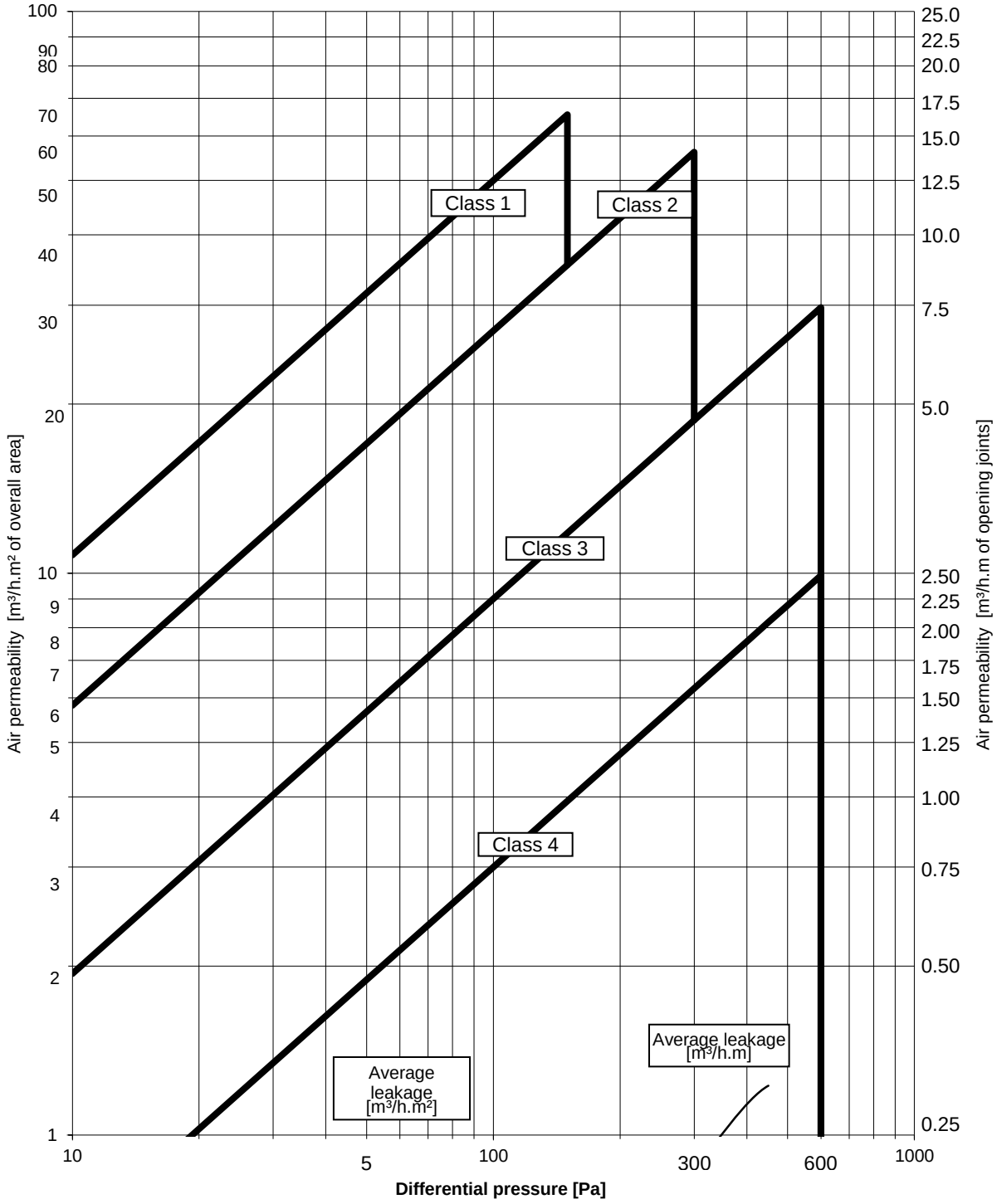
Overall area = 3.37m²

BS 6375-1:2015 Clause 6.2 - Joint class = 4

BS 6375-1:2015 Clause 6.2 - Area class = 4

BS 6375-1:2015 Clause 6.2 - Overall class = 4

Graph of Average Air Permeability Before Gusting.



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Water Tightness Test Results.

BS EN 1027:2000 Clause 7 Watertightness before resistance to wind loads

TABLE 2 - Spraying method 1A

Pressure (Pascals)	Point and time at which water leakage occurred
0	No Leakage
50	No Leakage
100	No Leakage
150	No Leakage
200	No Leakage
250	No Leakage
300	No Leakage
450	No Leakage
600	No Leakage
750	No Leakage
900	No Leakage
1050	No Leakage

Wind Resistance Test Results - BS EN 12211:2000.

Clause 8 Resistance to wind load

P1 DEFLECTION TEST

Three positive pressure pulses at 2640Pa were applied

No visible failures or functional defects to the sample were observed after wind loads applied at a positive pressure of 2400Pa

Actual deflection – 1.92mm (maximum deflection allowed 8.90mm)

Deflection/span ratio 1/700 (maximum ratio allowed 1/150)

Three negative pressure pulses at 2640Pa were applied

No visible failures or functional defects to the sample were observed after wind loads applied at a negative pressure of 2400Pa

Actual deflection – 1.12mm (maximum deflection allowed 8.90mm)

Deflection/span ratio 1/1200 (maximum ratio allowed 1/150)

Wind Resistance Test Results - BS EN 12211:2000. (Continued)

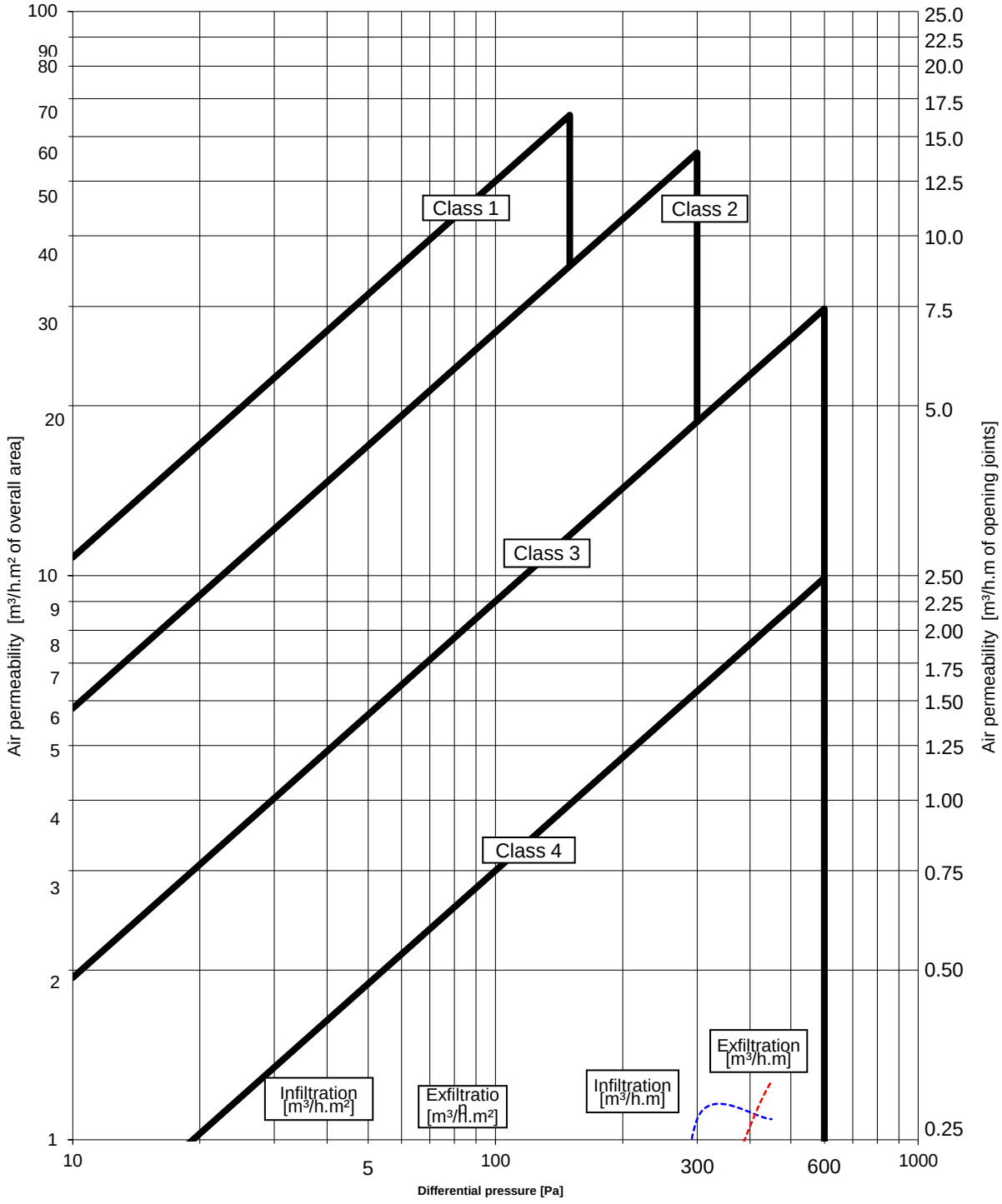
P2 REPEATED PRESSURE TEST

No visible failures or functional defects to the sample were observed after 50 cycles of repeated wind loads applied at a positive pressure of 1200Pa

No visible failures or functional defects to the sample were observed after 50 cycles of repeated wind loads applied at a negative pressure of 1200Pa

In accordance with BS 6375-1:2015 Clause 6.5, as the classification after the resistance to wind load tests is the same as the classification before the resistance to wind load tests, the resulting classification for the sample is Class 2.

Graph of Air Permeability After Gusting.



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Table of Average Air Permeability After Gusting.

Clause 6 After resistance to wind tests

Three positive pressure pulses of 660Pa were applied prior to testing

Table 4

Air Pressure [Pa]	Average rate of air leakage [m³/h]	Average rate of air leakage per meter length of opening joint [m³/h.m]	Average rate of air leakage relative to area of sample [m³/h.m²]
50	0.5	0.11	0.15
100	0.5	0.12	0.16
150	0.6	0.15	0.19
200	0.7	0.16	0.21
250	0.6	0.14	0.18
300	0.9	0.22	0.28
450	1.3	0.29	0.38
600	1.3	0.31	0.40

Note: The figures in the table above give the leakage as an average of the leakage at positive pressure and the leakage at negative pressure

Total opening perimeter = 4.37m

Overall area = 3.37m²

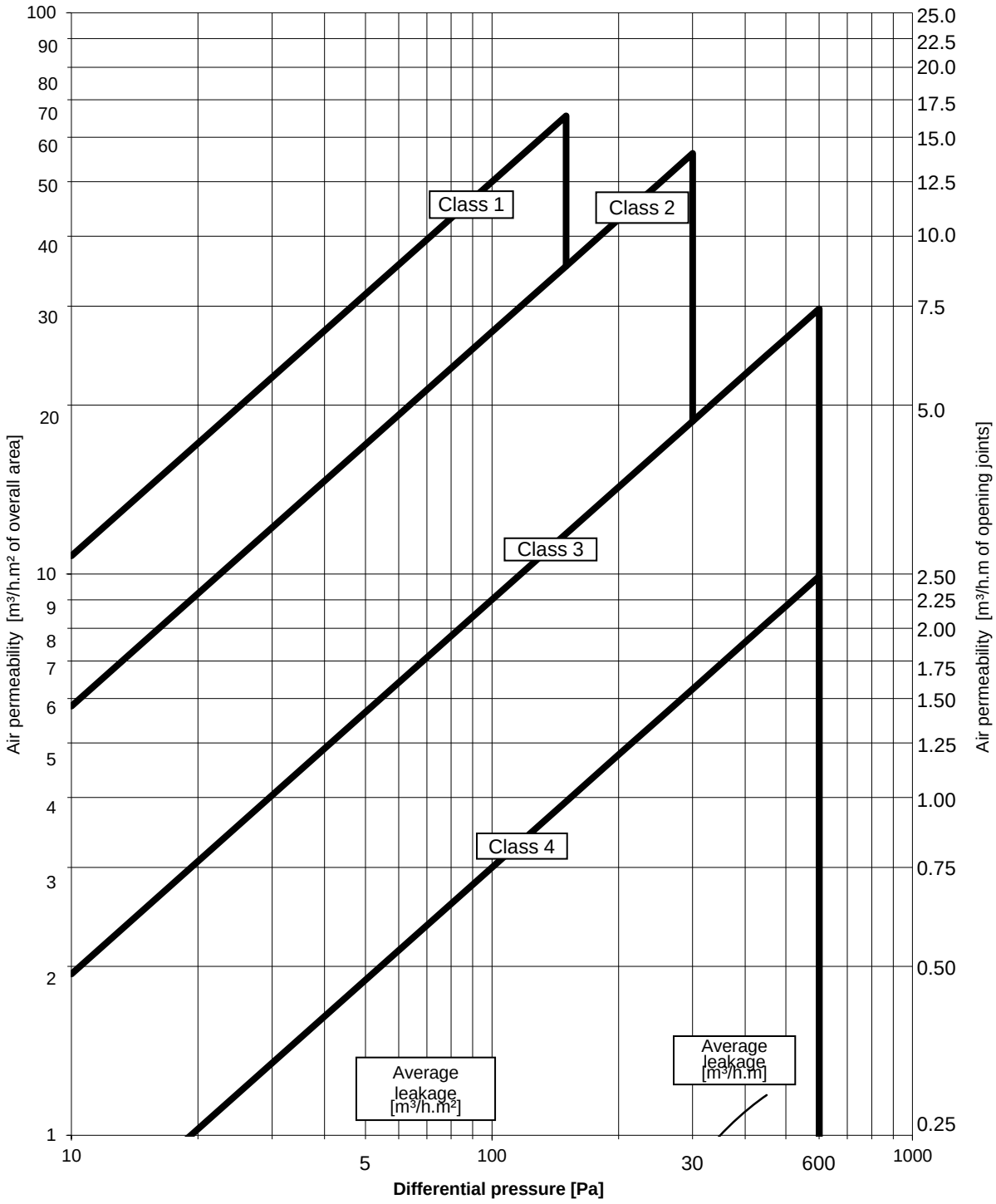
BS 6375-1:2015 Clause 6.5 - Joint class = 4

BS 6375-1:2015 Clause 6.5 - Area class = 4

BS 6375-1:2015 Clause 6.5 - Overall class = 4

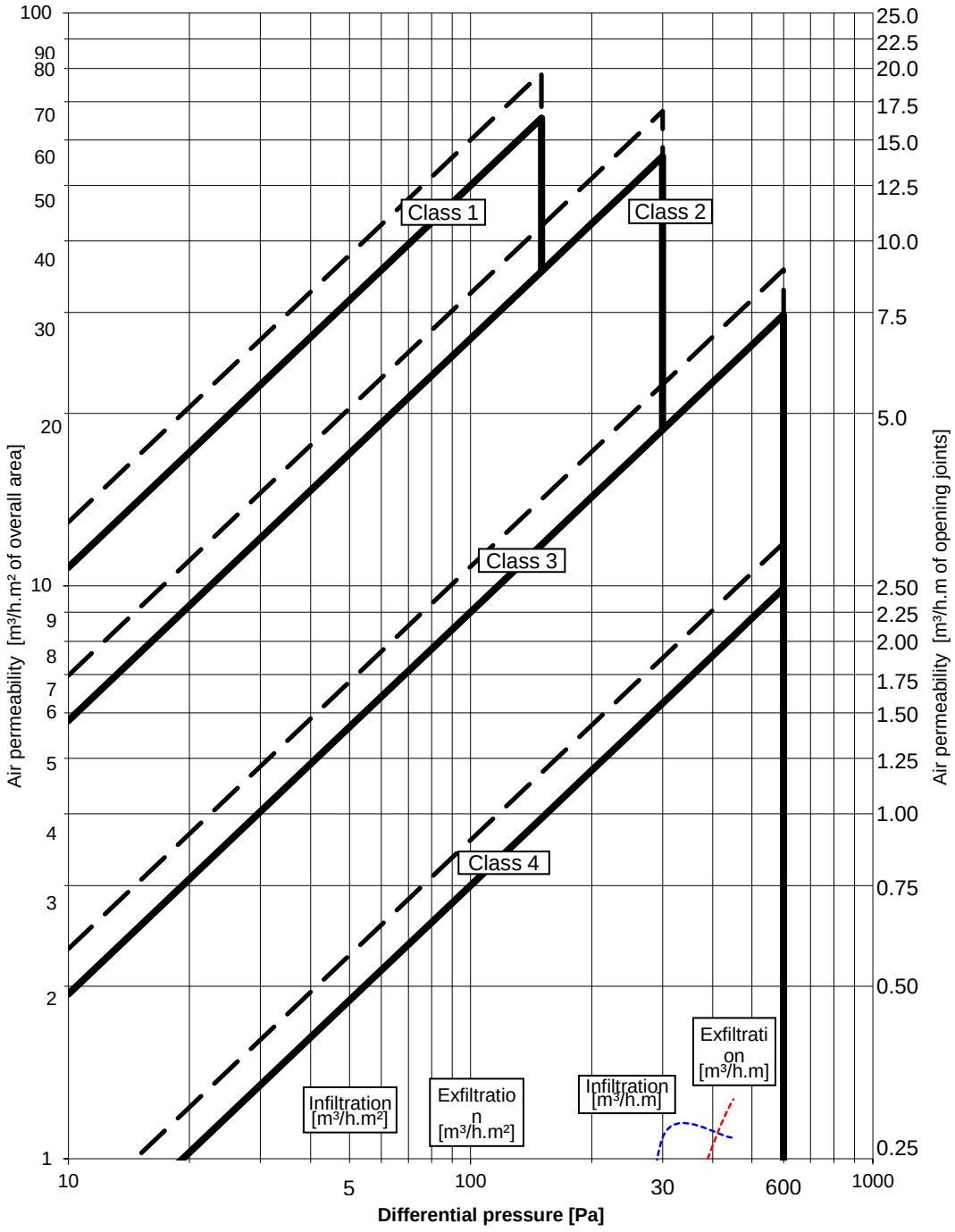
In accordance with BS 6375-1:2015 Clause 6.5, as the classification after the resistance to wind load tests is the same as the classification before the resistance to wind load tests, the resulting classification for the sample is Class 4.

Graph of Average Air Permeability After Gusting.



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Average Graph of Air Permeability After Gusting Including +20% Lines For Each Class.



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Wind Load Resistance Test Results - BS EN 12211:2000.

P3 SAFETY TEST

No parts of the test sample became detached and the test sample remained closed after a wind load safety test applied at a positive air pressure of 3600Pa.

No parts of the test sample became detached and the test sample remained closed after a wind load safety test applied at a negative air pressure of 3600Pa.

Basic security (Annex A).
BS 6375: Part 3: 2009 - Performance of Windows.

The objective of this test is to establish from if from the outside entry can be gained by defeating the glazing or locking system.

The force used did not result in permanent set or plastic deformation of any tool.

Damaged tools shall be replaced and the test did not exceed the maximum 3 minute time period.

The screwdriver was used to no effect

No entry could be effected Pass

Photograph of Sample.(sample 3)



Test Samples.

Sample Id	ER Number	Description
1	10158566	Aluminium Alloy Windows

Description of Test Samples.

Sample Description
1 off projecting side hung next to projecting side hung window
1 off projecting top hung window
1 off projecting side hung next to fixed window

Test Requirements.

BS4873 Type Test

Clause	Requirements
As required	**Test and assessment** *See Table A – BS4873 Type Test*

Summary of Test Comments.

Clause	Comments

Glossary of Terms.

PASS: Complies. Tested by BSI engineers at BSI laboratories.

PASS1: Complies. Witnessed by BSI engineers in manufacturers laboratory.

PASS2: Complies. Tests carried out by third party lab; results accepted by BSI.

PASS*: Report resulted in uncertainty and states that Compliance is more probable than non-compliance.

FAIL: Non compliance – Product does not meet the requirements of this clause.

FAIL*: Report resulted in uncertainty and states that Non-compliance is more probable than compliance.

N/A: Not applicable to design under consideration.

N/T: Not tested due to similarity to previously tested item; reference earlier test report.

Conditions of Issue.

This Test Report is issued subject to the conditions stated in current issue of 'BSI Terms of Service'. The results contained herein apply only to the particular sample(s) tested and to the specific tests carried out, as detailed in this Test Report. The issuing of this Test Report does not indicate any measure of Approval, Certification, Supervision, Control or Surveillance by BSI of any product. No extract, abridgement or abstraction from a Test Report may be published or used to advertise a product without the written consent of BSI, who reserve the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.

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*** End of Report ***