

Kitemark™ Certificate

This is to certify that:

Smart Systems Limited
Incorporating Smart Extrusions
Arnolds Way
Yatton
BS49 4QN
United Kingdom

Holds Certificate Number:

KM 81543

In respect of:

BS 4873
Aluminium Window System Supplier

This issues the right and licence to use the Kitemark in accordance with the Kitemark Terms and Conditions governing the use of the Kitemark, as may be updated from time to time by BSI Assurance UK Ltd (the "Conditions"). All defined terms in this Certificate shall have the same meaning as in the Conditions.

The use of the Kitemark is authorized in respect of the Product(s) detailed on this Certificate provided at or from the above address.

For and on behalf of BSI:

Gary Fenton, Global Product Certification Director

First Issued: 03/02/2005

Latest Issue: 18/05/2016



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...making excellence a habit.™

Kitemark™ Certificate

No. KM 81543

BS 4873:2009 - Aluminium alloy windows and doorsets.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirements can be incorporated within the system(s) detailed.

Alitherm 300 System Aluminium Alloy Window system

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Alitherm 300 Windows Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only with mechanically fixed transoms/mullions.

Ventilation: None

Window Types: Casement windows
Fixed windows
Multilight windows comprising opening light(s) with or without fixed light(s)

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Latest Issue: 18/05/2016

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BSI Assurance UK Limited, registered in England under number 7805321 at 389 Chiswick High Road, London W4 4AL, UK.
A member of BSI Group of Companies.

Kitemark™ Certificate

No. KM 81543

Size Limitations and Performance Characteristics Alitherm 300 Aluminium Alloy Window System

Window Type	Length (mm) Maximum	Height (mm) - Maximum	Perimeter (mm) - Maximum	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:								
Projecting top hungs Internally Beaded	1400	1400	-	-	4	7A	AE2400	2000+
Projecting top hungs Externally Beaded	1400	1400	-	-	4	5A	AE2400	2000+
Projecting side hungs Internally Beaded	600	1400	-	-	4	7A	AE2400	2000+
Projecting side hungs Externally Beaded	600	1400	-	-	4	5A	AE2400	2000+
Overall dimensions for windows with approved outer frame profiles:								
Fixeds Internally Beaded	2100	2100	8400	-	4	7A	AE2400	2000+
Fixeds Externally Beaded	2100	2100	8400	-	4	5A	AE2400	2000+
Overall dimensions for windows with approved outer frame & transom/mullion profiles:								
Multilights, ETC335 T/M Internally Beaded	2100	2100	7100	1450	4	7A	AE2400	2000+
Multilights, ETC 335 T/M Externally Beaded	2100	2100	7100	1450	4	5A	AE2400	2000+

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Kitemark™ Certificate

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BS 4873:2009 - Aluminium alloy windows and doorsets.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirements can be incorporated within the system(s) detailed.

Alitherm 600 System Aluminium Alloy Window system

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Alitherm 600 Windows & Doors Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Fixed windows
Multilight windows comprising opening light(s) with or without fixed light(s)

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Kitemark™ Certificate

No. KM 81543

Size Limitations and Performance Characteristics

Alitherm 600 Aluminium Alloy Window System

Window Type	Length (mm) Maximum	Height (mm) - Maximum	Perimeter (mm) - Maximum	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:								
Projecting top hungs Internally beaded	1400	1500	-	-	4	7A	AE2400	2000+
Projecting top hungs Externally beaded	1400	1500	-	-	4	5A	AE2400	2000+
Projecting side hungs Internally beaded	1000	1400	-	-	4	7A	AE2400	2000+
Projecting side hungs Externally beaded	1000	1400	-	-	4	5A	AE2400	2000+
Overall dimensions for windows with approved outer frame profiles:								
Fixeds Internally beaded	2100	2100	8400	-	4	7A	AE2400	2000+
Fixeds Externally beaded	2100	2100	8400	-	4	5A	AE2400	2000+
Overall dimensions for windows with approved outer frame & transom/mullion profiles:								
Multilight, ETC335 T/M Internally beaded	2100	2100	7100	1450	4	7A	AE2400	2000+
Multilight ETC335 T/M Externally beaded	2100	2100	7100	1450	4	5A	AE2400	2000+

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BS 4873:2009 - Aluminium alloy windows and doorsets.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirements can be incorporated within the system(s) detailed.

Alitherm 700 System Aluminium Alloy Window system

Fabrication and Installation:	Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s): Smart Systems Alitherm 700 Windows Manual
System description:	The windows are thermally broken, double glazed only, internally beaded, multipoint locking only, with mechanically fixed transoms/mullions
Ventilation:	None
Window Types:	Casement windows Parallel opening windows Fully reversible windows Fixed windows

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Kitemark™ Certificate

No. KM 81543

Size Limitations and Performance Characteristics

Alitherm 700 Aluminium Alloy Window System

Window Type	Length (mm) Maximum	Height (mm) - Maximum	Perimeter (mm) - Maximum	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:								
Projecting Top Hungs	1600	1600			4	9A	AE2400	2000+
Projecting Side Hungs	840	1500			4	9A	AE2400	2000+
Parallel	1800	2100	7200	-	4	9A	AE2400	2000+
Reversible	1500	1558	6116	-	4	9A	AE2400	2000+
Fixeds	2100	2100	7800		4	9A	AE2400	2000+

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BS 4873:2009 - Aluminium alloy windows and doorsets.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirements can be incorporated within the system(s) detailed.

Alitherm 800 System Aluminium Alloy Window system

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Alitherm 800 Windows & Doors Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Fixed windows
Multilight windows comprising opening light(s) with or without fixed light(s)

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Kitemark™ Certificate

No. KM 81543

Size Limitations and Performance Characteristics

Alitherm 800 Aluminium Alloy Window System

Window Type	Length (mm) Maximum	Height (mm) - Maximum	Perimeter (mm) - Maximum	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:								
Projecting top hungs	1400	1300	-	-	3	8A	A2	800
Projecting side hungs	800	1400	-	-	3	E1050	AE	2000
Overall dimensions for windows with approved outer frame profiles:								
Fixeds	2100	2100	4800	-	3	E1050	AE	2000
Overall dimensions for windows with approved outer frame & transom/mullion profiles:								
Multilights, ETC831 T/M reinforcement	2100	2100	7100	1450	3	E1050	AE	2000

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Eco Futural System Aluminium Alloy Window system

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Eco Futural Windows & Doors Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Tilt/Turn windows
Fixed windows
Multilight windows comprising opening light(s) with or without fixed light(s)

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Kitemark™ Certificate

No. KM 81543

Size Limitations and Performance Characteristics

EcoFutural Aluminium Alloy Window System

Window Type	Length (mm) Maximum	Height (mm) - Maximum	Perimeter (mm) - Maximum	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:								
Projecting top hungs	1440	2500	-	-	3	8A	A5	2000
Projecting side hungs	840	1440	-	-	4	E1050	AE2400	2000+
Overall dimensions for windows with approved outer frame profiles:								
Fixeds	2100	2100	4800	-	4	E1050	AE	2000
Tilt/Turns	1600*	2400	-	-	4	E900	AE	2400
Overall dimensions for windows with approved outer frame & transom/mullion profiles:								
Multilights	2400	2100	7680	1345	4	E1050	AE	2000

*Width of the Tilt/Turn Sash must not exceed 1½ times the height.

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BS 4873:2009 - Aluminium alloy windows and doorsets.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirements can be incorporated within the system(s) detailed.

Alitherm Heritage System Aluminium Alloy Window system

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Alitherm Heritage Windows Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Fixed windows
Multilight windows comprising opening light(s) with or without fixed light(s)

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Kitemark™ Certificate

No. KM 81543

Size Limitations and Performance Characteristics Alitherm Heritage Aluminium Alloy Window System

Window Type	Length (mm) Maximum	Height (mm) - Maximum	Perimeter (mm) - Maximum	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:								
Projecting top hungs Internally Beaded	1400	1400	-	-	4	9A	AE2400	2000+
Projecting top hungs Externally Beaded	1400	1400	-	-	4	9A	AE2400	2000+
Projecting side hungs Internally Beaded	600	1400	-	-	4	9A	AE2400	2000+
Projecting side hungs Externally Beaded	600	1400	-	-	4	9A	AE2400	2000+
Overall dimensions for windows with approved outer frame profiles:								
Fixeds Internally Beaded	2100	2100	8400	-	4	9A	AE2400	2000+
Fixeds Externally Beaded	2100	2100	8400	-	4	9A	AE2400	2000+
Overall dimensions for windows with approved outer frame & transom/mullion profiles:								
Multilight, W2035 T/M Internally Beaded	2100	2100	7100	1450	4	9A	AE2400	2000+
Multilight, W2035 T/M Externally Beaded	2100	2100	7100	1450	4	9A	AE2400	2000+

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Kitemark™ Certificate

This is to certify that:

Smart Systems Limited
Incorporating Smart Extrusions
Arnolds Way
Yatton
BS49 4QN
United Kingdom

Holds Certificate Number:

KM 81580

In respect of:

BS 4873 / PAS24
Enhanced Security Aluminium Window System Supplier

This issues the right and licence to use the Kitemark in accordance with the Kitemark Terms and Conditions governing the use of the Kitemark, as may be updated from time to time by BSI Assurance UK Ltd (the "Conditions"). All defined terms in this Certificate shall have the same meaning as in the Conditions.

The use of the Kitemark is authorized in respect of the Product(s) detailed on this Certificate provided at or from the above address.

For and on behalf of BSI:

Gary Fenton, Global Product Certification Director

First Issued: 03/02/2005

Latest Issue: 18/05/2016



Kitemark™ Certificate

No. KM 81580

BS 4873:2009 / PAS 24:2016 - Enhanced security performance requirements for window assemblies.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirement can be incorporated within the system detailed.

Alitherm 300 Aluminium Alloy Window System

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Alitherm 300 Window Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Fixed windows
Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Profiles	Outer Frame(s)	ETC303/304/305/306/308/310/313/
	Transom/Mullion(s)	ETC333/335/336
	Sash(es)	ETC321/323/324N/326/327/328N/329/423/424N
	Rebate Reverser	ETC343/344/345/346N

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Kitemark™ Certificate

No. KM 81580

Hardware - Alitherm 300 Aluminium Alloy Window System

Caseament windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays Nico Friction Hinges	Smart Systems	ACET070	Smart Systems
Securistyle Vector Excluder ASD2 hinge protectors	Smart Systems	ACET066	Smart Systems
Trojan Shootbolt/mushroom bolt espagnolette locking system	Smart Systems	Espagnolette & keeps: ACET066	Smart Systems
ACET081/ACET165 Key locking handles	Smart Systems	ACET069	Smart Systems
Run-up blocks 4 off per sash	-		

*Glass retention as specified for the fixed windows.

Dummy vent windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays	Smart Systems	ACET070	Smart Systems

*Glass retention as specified for the fixed windows.

Fixed windows

Glass retention: External: Glazing beads and Glaslok Securi-clip security glazing clips
Internal: Glazing beads

Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Hardware/Fixing requirements are as specified for opening, dummy vent and fixed window types.

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Kitemark™ Certificate

No. KM 81580

Size Limitations and Performance Characteristics

Alitherm 300 Aluminium Alloy Window System

Window Type	Length (mm) - Maximum	Height (mm) - Maximum	Area(m ²) - Maximum	Friction Stays (up to and including)	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:									
Projecting top hungs Internally beaded	1400	1400	-	24"	-	4	7A	AE2400	2000+
Projecting top hungs Externally beaded	1400	1400	-	24"	-	4	5A	AE2400	2000+
Projecting side hungs Internally beaded	600	1400	-	16"	-	4	7A	AE2400	2000+
Projecting side hungs Externally beaded	600	1400	-	16"	-	4	5A	AE2400	2000+
Overall dimensions for windows with approved outer frame profiles:									
Fixeds Internally Beaded	2100	2100	4.2	-	-	4	7A	AE2400	2000+
Fixeds Externally Beaded	2100	2100	4.2	-	-	4	5A	AE2400	2000+
Overall dimensions for approved outer frames & transom/mullion profiles:									
Multilight ETC335 T/M Internally Beaded	2100	2100	2.5	-	1450	4	7A	AE2400	2000+
Multilight ETC335 T/M Externally Beaded	2100	2100	2.5	-	1450	4	5A	AE2400	2000+

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Kitemark™ Certificate

No. KM 81580

BS 4873:2009 / PAS 24:2016 - Enhanced security performance requirements for window assemblies.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirement can be incorporated within the system detailed.

Alitherm 600 Aluminium Alloy Window System

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Alitherm 600 Window Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Fixed windows
Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Profiles	Outer Frame(s)	ETC610/ETC611/ETC612/ETC613/ETC614/ETC615/ ETC616/ETC619/ETC6101
	Transom/Mullion(s)	ETC630/ETC631/ETC632/ETC633/ETC634/ETC635/ ETC636/ETC638/ETC639/ETC6301/
	Sash(es)	ETC620/ETC621/ETC622/ETC623/ETC624/ETC625/ ETC627/ETC628
	Rebate Reverser	ETC645/ETC647/ETC648

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No. KM 81580

Hardware - Alitherm 600 Aluminium Alloy Window System

Casement windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays Nico Friction Hinges	Smart Systems	ACET070	Smart Systems
Securistyle Vector Excluder ASD2 hinge protectors	Smart Systems	ACET066	Smart Systems
Trojan Shootbolt/mushroom bolt espagnolette locking system	Smart Systems	Espagnolette & keeps: ACET066	Smart Systems
ACET081/ACET165 Key locking handles	Smart Systems	ACET069	Smart Systems
Run-up blocks 4 off per sash	-		

*Glass retention as specified for the fixed windows.

Dummy vent windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays	Smart Systems	ACET070	Smart Systems

*Glass retention as specified for the fixed windows.

Fixed windows

Glass retention: External: Glazing beads and Glaslok Securi-clip security glazing clips
Internal: Glazing beads

Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Hardware/Fixing requirements are as specified for opening, dummy vent and fixed window types.

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Kitemark™ Certificate

No. KM 81580

Size Limitations and Performance Characteristics

Alitherm 600 Aluminium Alloy Window System

Window Type	Length (mm) - Maximum	Height (mm) - Maximum	Area (m ²) - Maximum	Friction Stays (up to and including)	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:									
Projecting top hungs Internally beaded	1400	1500	-	24"	-	4	7A	AE2400	2000+
Projecting top hungs Externally beaded	1400	1500	-	24"	-	4	5A	AE2400	2000+
Projecting side hungs Internally beaded	1000	1400	-	16"	-	4	7A	AE2400	2000+
Projecting side hungs Externally beaded	1000	1400	-	16"	-	4	5A	AE2400	2000+
Overall dimensions for windows with approved outer frame profiles:									
Fixeds Internally Beaded	2100	2100	4.2	-	-	4	7A	AE2400	2000+
Fixeds Externally Beaded	2100	2100	4.2	-	-	4	5A	AE2400	2000+
Overall dimensions for approved outer frames & transom/mullion profiles:									
Multilight ETC335 T/M Internally Beaded	2100	2100	2.5	-	1450	4	7A	AE2400	2000+
Multilight ETC335 T/M Externally Beaded	2100	2100	2.5	-	1450	4	5A	AE2400	2000+

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Kitemark™ Certificate

No. KM 81580

BS 4873:2009 / PAS 24:2016 - Enhanced security performance requirements for window assemblies.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirement can be incorporated within the system detailed.

Alitherm 700 Aluminium Alloy Window System

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Alitherm 700 Windows Manual

System description: The windows are thermally broken, double glazed only, internally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Parallel opening windows
Fully reversible windows
Fixed windows

Profiles	Outer Frame(s)	ETC710/ETC716/ETC717/ETC718
	Sash(es)	ETC720/ETC721/ETC725
	Mullion/Transom	ETC 730/ ETC733/ETC736/ ETC737
	Rebate Reverser	ETC745/ETC746/ETC747

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Kitemark™ Certificate

No. KM 81580

Hardware - Alitherm 700 Aluminium Alloy Window System

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays Nico Friction Hinges	Smart Systems	ACET070	Smart Systems
Securistyle Vector Excluder ASD2 hinge protectors	Smart Systems	ACET066	Smart Systems
Locking Kit ACE710	Smart Systems		Smart Systems
ACET081/ACET165 Key locking handles	Smart Systems	ACET069	Smart Systems
Run-up blocks 4 off per sash	-		

*Glass retention as specified for the fixed windows.

Fixed windows

Glass retention: Internal: Glazing beads

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Kitemark™ Certificate

No. KM 81580

Size Limitations and Performance Characteristics

Alitherm 700 Aluminium Alloy Window System

Window Type	Length (mm) - Maximum	Height (mm) - Maximum	Area(m ²) - Maximum	Friction Stays (up to and including)	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:									
Projecting Top Hungs	1600	1600	-	-	-	4	9A	AE2400	2000+
Projecting Side Hungs	840	1500	-	-	-	4	9A	AE2400	2000+
Parallel	1800	2100	3.7	-	-	4	9A	AE2400	2000+
Reversible	1500	1558	2.2	-	-	4	9A	AE2400	2000+
Fixeds	2100	2100	4.2	-	-	4	9A	AE2400	2000+

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Kitemark™ Certificate

No. KM 81580

BS 4873:2009 / PAS 24:2016 - Enhanced security performance requirements for window assemblies.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirement can be incorporated within the system detailed.

Alitherm 800 Aluminium Alloy Window System

Fabrication and Installation:	Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s): Smart Systems Alitherm 800 Windows and Doors Manual	
System description:	The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions	
Ventilation:	None	
Window Types:	Casement windows Fixed windows Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)	
Profiles	Outer Frame(s)	ETC810/ETC811/ETC812/ETC813/ ETC814/ETC815/ETC816/ETC817/ETC821 ETC8201
	Transom/Mullion(s)	ETC830/ETC832/ETC834/ETC835
	Sash(es)	ETC821/ETC823/ETC824/ETC825/ETC826 ETC827/ETC828/ETC829
	Rebate Reverser(Internal glazing)	ETC845/ETC846

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Kitemark™ Certificate

No. KM 81580

Hardware - Alitherm 800 Aluminium Alloy Window System

Casement windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays Nico Friction Hinges	Smart Systems	ACET070	Smart Systems
Securistyle Vector Excluder ASD2 hinge protectors	Smart Systems	ACET066	Smart Systems
Trojan Shootbolt/mushroom bolt espagnolette locking system	Smart Systems	Espagnolette & keeps: ACET066	Smart Systems
ACET081/ACET165 Key locking handles	Smart Systems	ACET069	Smart Systems
Run-up blocks 4 off per sash	-		

*Glass retention as specified for the fixed windows.

Dummy vent windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays	Smart Systems	ACET070	Smart Systems

*Glass retention as specified for the fixed windows.

Fixed windows

Glass retention: External: Glazing beads and Glaslok Securi-clip security glazing clips
Internal: Glazing beads

Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Hardware/Fixing requirements are as specified for opening, dummy vent and fixed window types.

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Kitemark™ Certificate

No. KM 81580

Size Limitations and Performance Characteristics

Alitherm 800 Aluminium Alloy Window System

Window Type	Length (mm) - Maximum	Height (mm) - Maximum	Area(m ²) - Maximum	Friction Stays (up to and including)	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:									
Projecting top hungs	1400	1300	-	24"	-	3	8A	A2	800
Projecting side hungs	800	1400	-	16"	-	3	E1050	AE	2000
Overall dimensions for windows with approved outer frame profiles:									
Fixeds	2100	2100	4.2	-	-	3	E1050	AE	2000
Overall dimensions for approved outer frames & transom/mullion profiles:									
Multilights ETC831 Transom/Mullion	2100	2100	2.9	-	1450	-	E1050	AE	2000

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Kitemark™ Certificate

No. KM 81580

BS 4873:2009 / PAS 24:2016 - Enhanced security performance requirements for window assemblies.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirement can be incorporated within the system detailed.

Eco Futural Aluminium Alloy Window System

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Eco Futural Windows and Doors Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Tilt/Turn windows
Fixed windows
Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Profiles	Outer Frame(s)	EF010/EF011/EF019/EF110/EF910
	Transom/Mullion(s)	EF030/EF031/EF032/EF033/EF034/ EF035/EF036/EF130/EF131/EF930
	Sash(es)	EF020/EF023/EF926
	Rebate Reverser(Internal glazing)	EF044/EF045/EF945/EF946

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Kitemark™ Certificate

No. KM 81580

Hardware - Eco Futural Aluminium Alloy Window System

Casement windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays Nico Friction Hinges	Smart Systems	ACET070	Smart Systems
Securistyle Vector hinge protectors	Smart Systems	ACET066	Smart Systems
ERA lock ACEF951-956	Smart Systems	Espagnolette & keeps: ACET066	Smart Systems
ACET081/ACET165 Key locking handles	Smart Systems	ACET069	Smart Systems
Run-up blocks 4 off per sash	-		

*Glass retention as specified for the fixed windows.

Tilt/Turn windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Chrono hinge stays	Smart Systems	Integral within gearing	Smart Systems
Chrono Safe TiltTurn gearing	Smart Systems	Integral within gearing	Smart Systems
Tilt/Turn Key locking handles	Smart Systems	ACET069	Smart Systems
Run-up blocks 4 off per sash	-		

*Glass retention as specified for the fixed windows.

Fixed windows

Glass retention: External: Glazing beads and Glaslok Securi-clip security glazing clips
Internal: Glazing beads

Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Hardware/Fixing requirements are as specified for opening, dummy vent and fixed window types.

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Kitemark™ Certificate

No. KM 81580

Size Limitations and Performance Characteristics

Eco Futural Aluminium Alloy Window System

Window Type	Length (mm) - Maximum	Height (mm) - Maximum	Area(m ²) - Maximum	Friction Stays (up to and including)	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:									
Projecting top hungs	1440	2500	-	24"	-	3	8A	A5	2000
Projecting side hungs	840	1440	-	16"	-	4	E1050	AE2400	2000+
Overall dimensions for windows with approved outer frame profiles:									
Fixeds	2100	2100	4.2	-	-	3	E1050	AE	2000
Tilt/Turns	1600*	2400	-	-	-	4	E900	AE	2400
Overall dimensions for approved outer frames & transom/mullion profiles:									
Multilights ETC831 Transom/Mullion	2400	2100	3.1	-	1345	4	E1050	AE	2000

*Width of the Tilt/Turn Sash must not exceed 1½ times the height.

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Kitemark™ Certificate

No. KM 81580

BS 4873:2009 / PAS 24:2016 - Enhanced security performance requirements for window assemblies.

This Certificate covers the following window system design specification. Only those components that have been approved in accordance with the Kitemark scheme requirement can be incorporated within the system detailed.

Alitherm Heritage Aluminium Alloy Window System

Fabrication and Installation: Fabricated and installed in accordance with the latest issue(s) of the following Smart Systems Limited controlled manual(s):

Smart Systems Alitherm Heritage Window Manual

System description: The windows are thermally broken, double glazed only, internally or externally beaded, multipoint locking only, with mechanically fixed transoms/mullions

Ventilation: None

Window Types: Casement windows
Fixed windows
Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Profiles	Outer Frame(s)	W20015/20016/20017/20018
	Transom/Mullion(s)	W20032/20034/20035/20037/20039
	Sash(es)	W20024/20025/20026/20028/20029/20122
	Rebate Reverser	W20047/20147

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Kitemark™ Certificate

No. KM 81580

Hardware - Alitherm Heritage Aluminium Alloy Window System

Casement windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Restrictor stays Nico Friction Hnges	Smart Systems	ACET070	Smart Systems
Securistyle Vector Excluder ASD2 hinge protectors	Smart Systems	ACET066	Smart Systems
Shootbolt/mushroom bolt espagnolette locking system ACW201-205	Smart Systems	Espagnolette & keeps: ACET066	Smart Systems
ACET165 Key locking handles	Smart Systems	ACET069	Smart Systems
Run-up blocks 4 off per sash	-		

*Glass retention as specified for the fixed windows.

Dummy vent windows*

Hardware Reference	Hardware Supplier	Fixing Specification	Fixing Supplier
Securistyle Defender stays	Smart Systems	ACET070	Smart Systems

*Glass retention as specified for the fixed windows.

Fixed windows

Glass retention: External: Glazing beads and Glaslok Securi-clip security glazing clips
Internal: Glazing beads

Multilight windows comprising opening light(s) and/or dummy vent(s) or fixed light(s)

Hardware/Fixing requirements are as specified for opening, dummy vent and fixed window types.

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Kitemark™ Certificate

No. KM 81580

Size Limitations and Performance Characteristics

Alitherm Heritage Aluminium Alloy Window System

Window Type	Length (mm) - Maximum	Height (mm) - Maximum	Area(m ²) - Maximum	Friction Stays (up to and including)	Transom/Mullion Length (mm) inc frame - Maximum	Air Permeability classification	Watertightness classification	Resistance to Wind classification	Exposure category as given in Table 1 of BS 6375-1:2009
Sash dimensions for windows with approved sash profiles:									
Projecting top hungs Internally beaded	1400	1400	-	24"	-	4	7A	AE2400	2000+
Projecting top hungs Externally beaded	1400	1400	-	24"	-	4	5A	AE2400	2000+
Projecting side hungs Internally beaded	600	1400	-	16"	-	4	7A	AE2400	2000+
Projecting side hungs Externally beaded	600	1400	-	16"	-	4	5A	AE2400	2000+
Overall dimensions for windows with approved outer frame profiles:									
Fixeds Internally Beaded	2100	2100	4.2	-	-	4	7A	AE2400	2000+
Fixeds Externally Beaded	2100	2100	4.2	-	-	4	5A	AE2400	2000+
Overall dimensions for approved outer frames & transom/mullion profiles:									
Multilight W2035 T/M Internally Beaded	2100	2100	2.5	-	1450	4	7A	AE2400	2000+
Multilight W2035 T/M Externally Beaded	2100	2100	2.5	-	1450	4	5A	AE2400	2000+

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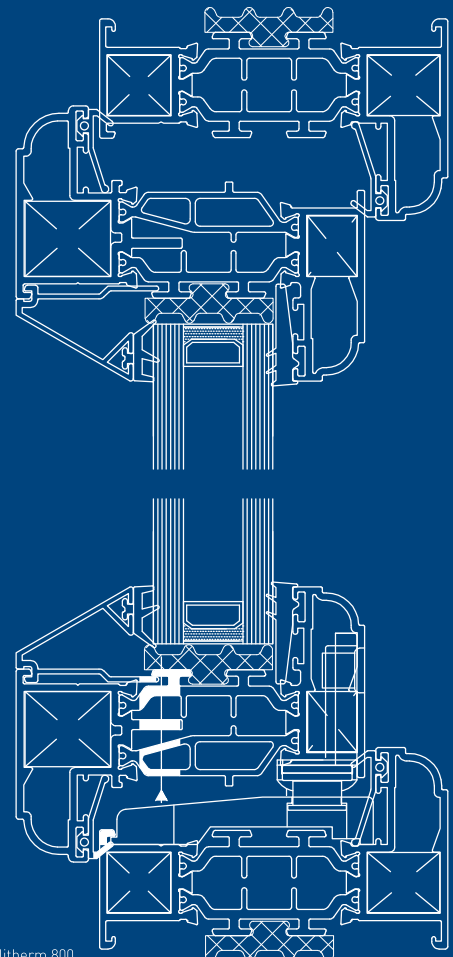
smart
architectural aluminium

Alitherm Series

The Alitherm series of windows offer a range of high quality glazing solutions for side hung, top hung open out, top swing reversible and parallel opening casements, suitable for both the residential and commercial markets.

The series features products that achieve:

- Window Energy Rating A
- BRE Green Guide A
- U Values up to 1.2 W/m²K depending on system and glass unit
- Includes the Kitemarked systems Alitherm 600 & 800 with PAS 24: 2012 Security



Alitherm 800



Alitherm Series

This versatile range of profiles can provide many solutions such as traditional casement windows inspired by the elegance and styling of timber products, or automatic parallel opening commercial windows designed to provide a balanced airflow in multi-storey commercial buildings.

All Alitherm profiles utilise Smart's innovative polyamide thermal break technology which creates a barrier between the cold air outside and the warm air inside. This technology significantly reduces thermal transmittance and enhances the overall U Value of a product. Alitherm products are available in a choice of standard or non-standard colours, including metallic, dual colour, Smart's Sensations textured, and Alchemy anodised effect finishes. The series features the new Alitherm 300, Alitherm 600, Alitherm 700 and Alitherm 800 windows, designed to meet the exacting requirements of Document L 2010.

Alitherm 300

Application

All general light use applications

Features

- The system features an extended polyamide thermal break which improves the overall U Value of the profile, allowing Alitherm 300 to achieve a Window Energy 'A' Rating when used in conjunction with the correct double or triple glazed unit
- The system is suitable for both internally or externally beaded, side or top hung open out windows
- Profiles have the option of either ovolo, chamfered or square edges
- Frame options for both standard and slim-line stays
- Option of either multi-point or cockspur locking handles

Technical Performance

Finish

Single or dual colour, marine quality polyester powder coat as standard

U Value

U Value 1.5W/m²K using 1.0 centre pane
U Value 1.2W/m²K using 0.7 centre pane

WER

A

Air

Class 4, 600Pa

Water

Class E 1200Pa

Wind

Class AE, 2400Pa

Document L Compliant

Dimensions

Frame Depth

53mm & 76mm

Glass

24mm, 28mm, 32mm & 36mm double or triple glazed units

SH Max o/a Width

700mm

SH Max o/a Height

1400mm

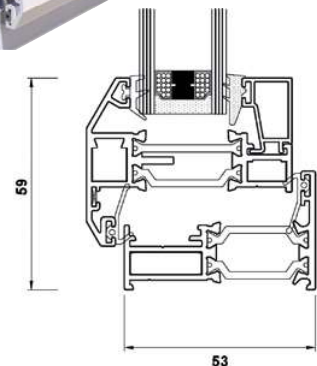
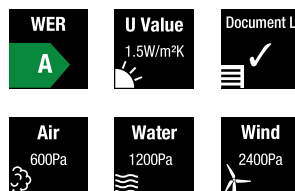
TH Max o/a Width

1400mm

TH Max o/a Height

1300mm

[For sizes outside of these parameters, contact Smarts Technical].



Alitherm 600

Application

All general light use applications inc commercial.

Features

- An enhanced system designed to comply with the revisions to the Building Regulations
- Document L compliant
- System can achieve Window Energy 'B' Rating
- Profiles feature an extended polyamide thermal break to enhance thermal performance
- Fabrication is by method of crimped or mechanical corners
- Ovolo, chamfered or square profiles
- British Standard Kitemarked system KM 81580 KM 81543

Technical Performance

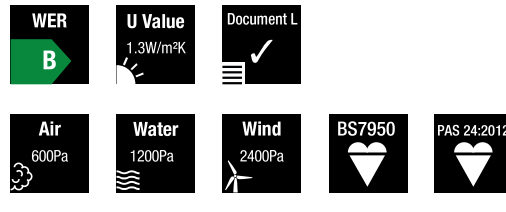
Finish Single or dual colour, marine quality polyester powder coat as standard

U Value	1.3W/m ² K using correct sealed unit
WER	B
Air	Class 4, 600Pa
Water	Class E, 1200Pa
Wind	Class AE, 2400Pa
Document L Compliant	

Dimensions

Frame Depth	59mm & 70mm
Glass	28mm to 38mm double or triple glazed units
SH Max o/a Width	1000mm
SH Max o/a Height	1400mm
TH Max o/a Width	1400mm
TH Max o/a Height	1500mm

(For sizes outside of these parameters, contact Smarts Technical).



Alitherm 800

Application

All general light use applications

Features

- Highest thermal performance window suitable for all general use applications
- Will achieve U Values under 1.6w/m²K when used in conjunction with correct double glazed sealed unit
- Alitherm 800 windows achieve a Window Energy 'A' Rating
- Extended chambered polyamide thermal breaks provide excellent thermal performance
- British Standard Kitemarked system KM 81580 KM 81543

Technical Performance

Finish Single or dual colour, marine quality polyester powder coat as standard

U Value 1.3W/m²K using 0.7 centre pane
1.5W/m²K using 1.0 centre pane

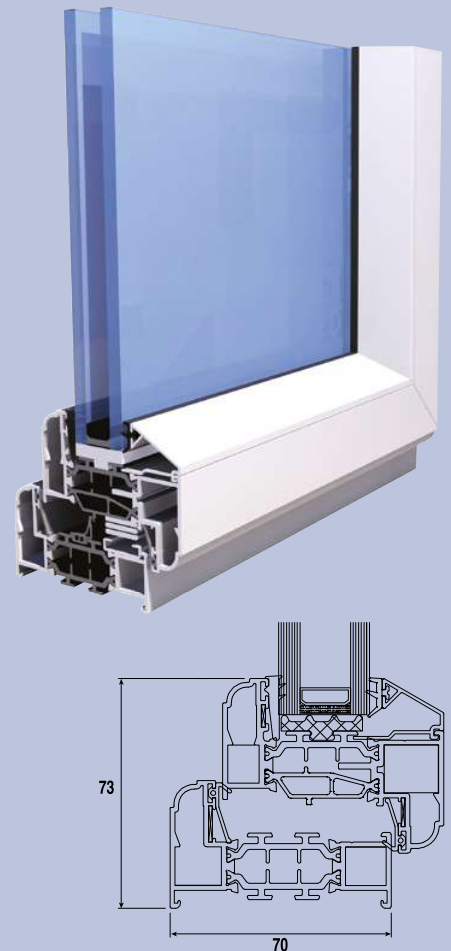
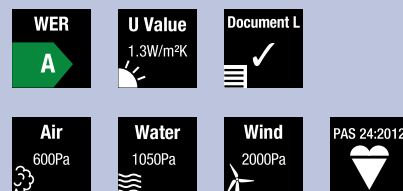
WER A

Air	Class 3, 600Pa
Water	Class E, 1050Pa
Wind	Class A5, 2000Pa
Security	PAS 24:2012
Document L Compliant	

Dimensions

Frame Depth	70mm
Glass	24mm, 28mm double or triple glazed units
SH Max o/a Width	700mm
SH Max o/a Height	1400mm
TH Max o/a Width	1400mm
TH Max o/a Height	1300mm

(For sizes outside of these parameters, contact Smarts Technical).



Alitherm 700

Alitherm Parallel is an innovative solution for enhanced natural ventilation. The system allows for a balanced, effective airflow whilst maintaining security and safety. The system can also be either a side or top hung casement, or top swing reversible window.



Application

Commercial applications, suitable for multi-storey

Features

- Alitherm 700 is ideal for insertion into curtain wall facades in both low and high rise commercial buildings
- The system is suitable for use as either replacement windows in existing buildings, or for installation into new builds
- Alitherm 700 incorporates internally beaded vents suitable for either cockspur or shoot-bolt locking.
- The system is also suitable for use with chain-operators, operated either individually or as part of an integrated automated solution for building climate control

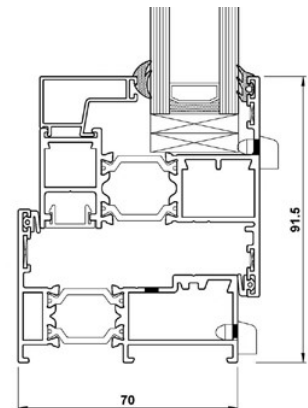
Technical Performance

Finish	Single or dual colour, marine quality polyester powder coat as standard
U Value	1.6W/m ² K using correct sealed unit 1.3W/m ² K using triple glazed unit of correct sealed unit
Air	Class 4, 600Pa
Water	Class 9A, 600Pa
Wind	Class E, 2400Pa
Security	BS 7950 (Casement and Parallels) PAS24:2012 (Reversible)

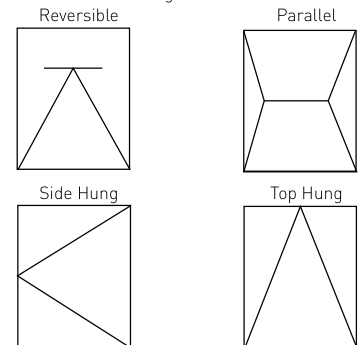
Dimensions

Frame Depth	70mm
Glass	28mm double or triple glazed units
PL Max o/a Width	2000mm
PL Max o/a Height	3000mm
SH Max o/a Width	838mm
SH Max o/a Height	1729mm
TH Max o/a Width	1729mm
TH Max o/a Height	2000mm
Rev Max o/a Width	1500mm
Rev Max o/a Height	1558mm

*Parallel windows over 1500mm wide or weighing over 100kg should be motorised operation only



Drawings not to scale



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Test Report



Report No	2370/7782492	This Report consists of 18 pages
Client	Smart Systems Limited Arnolds Way Yatton BS49 4QN	
Authority & date	Request by client dated 20 December 2011	
Items tested	4 off Aluminium windows, Smart Systems Alitherm 600 Internally Glazed Casement Window Systems	
Specification	BS 7950:1997 Specification for enhanced security performance of casement and tilt/turn windows for domestic applications	
Results	Pass	
Prepared by	D Kirsop	(Senior Technician)
Authorized by	M Manito	(Senior Engineer)
Issue Date	08 February 2012	
Conditions of issue	<p>This Test Report is issued subject to the conditions stated in current issue of CPO322 'General conditions relating to acceptance of testing'. 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 the Managing Director, BSI, who reserves the absolute right to agree or reject all or any of the details of any items or publicity for which consent may be sought.</p>	



TEST, EXAMINATION AND ASSESSMENT OF FOUR ALUMINIUM WINDOWS, SMART SYSTEMS ALITHERM 600

INTRODUCTION

At the request of the client the Aluminium windows, detailed below and described on pages 4 and 11, were tested and assessed to the requirements of BS 7950:1997 Specification for enhanced security performance of windows for domestic applications incorporating Amendments 14289 and 15666, as indicated on the following pages of this Report. This request was made on Quotation No BSI0000360080 dated 20 December 2011. It is emphasized that assessments have not been made against the other Clauses of the Specification.

TEST SAMPLE

2 off projecting side hung next to projecting side hung windows (Sample 1)

2 off projecting top hung windows (Sample 2)

(Equipment Record No 10132932)

Date sample received: 2 February 2012

SUMMARY OF RESULTS

- | | | |
|----|--------------------|---|
| 1. | Manipulation | The test samples met the requirements of the Specification in respect of Clause 7 Annex A.4. |
| 2. | Glazing removal | The test samples met the requirements of the Specification in respect of Clause 7 Annex A.5. |
| 3. | Mechanical loading | The test samples met the requirements of the Specification in respect of Clause 7 Annex A.6. |
| 4. | Manual check test | The test samples met the requirements of the Specification, in respect of Clause 7 Annex A.7. |

CLAUSE 4 SAMPLE SELECTION

The samples submitted for tests were selected by the Client.

CLAUSE 5.2 ASSESSMENT

The assessment of the test samples followed the sequence detailed in Scheme document PCP519.

CLAUSE 6 TEST APPARATUS AND SAMPLE MOUNTING

The test apparatus used for the manual and mechanical tests is shown in Appendix A of this Report. This apparatus meets the requirements of the Specification.
Each test sample was submitted for test mounted in a 50 x 100mm timber subframe in accordance with the manufacturer's installation requirements.

DESCRIPTION OF SAMPLE (Sample 1)

Sample type -	Projecting side hung next to projecting side hung
Material -	Aluminium
Construction -	Cleated
Fittings (each sash) -	Friction stays: 16" Securistyle Defender side hung stays Locking: a six point lock (six mushroom bolts) Trojan reverse espagnolette system operated by a key locking handle 4 of run up blocks 2 of pairs of Vector Excluder hinge protectors
Glass -	Double glazed, 4-20-4mm toughened glass sealed units
Glazing system -	Internal beads and gaskets
Sample dimensions -	For information only (nominal sizes) Overall size Length: 1455mm Height: 1275mm Sash sizes Length: 690mm Height: 1195mm

EXAMINATION AND TEST

Sample type - Projecting side hung next to projecting side hung

Date of test – 6 February 2012

Laboratory temperature – 19.1 °C

CLAUSE 7 PERFORMANCE REQUIREMENTS

ASSESSMENT

Annex A.4 Manipulation test

The sample was mounted vertically in the test rig as described in Annex A.2.
The test was carried out in accordance with the given objective of this Annex using the implements described in Annex A.3.

The key for the lockable hardware was fully removable.
No entry could be effected within 3 minutes.

Pass

Annex A.5 Glazing removal test

Annex A.5.1 Manual test

The sample was mounted vertically in the test rig as described in Annex A.2.
The sample was assessed using a selection of tools as described in Annex A.3.

No entry could be effected within 3 minutes

Pass

Annex A.5.2 Mechanical test

The sample was mounted vertically in the test rig as described in Annex A.2.
A perpendicular to plane load of 2.0kN was applied to each corner of the glazing in turn as specified in Annex A.5.2.

No evidence of bead failure
No entry could be effected

Pass

EXAMINATION AND TEST (CONTINUED)

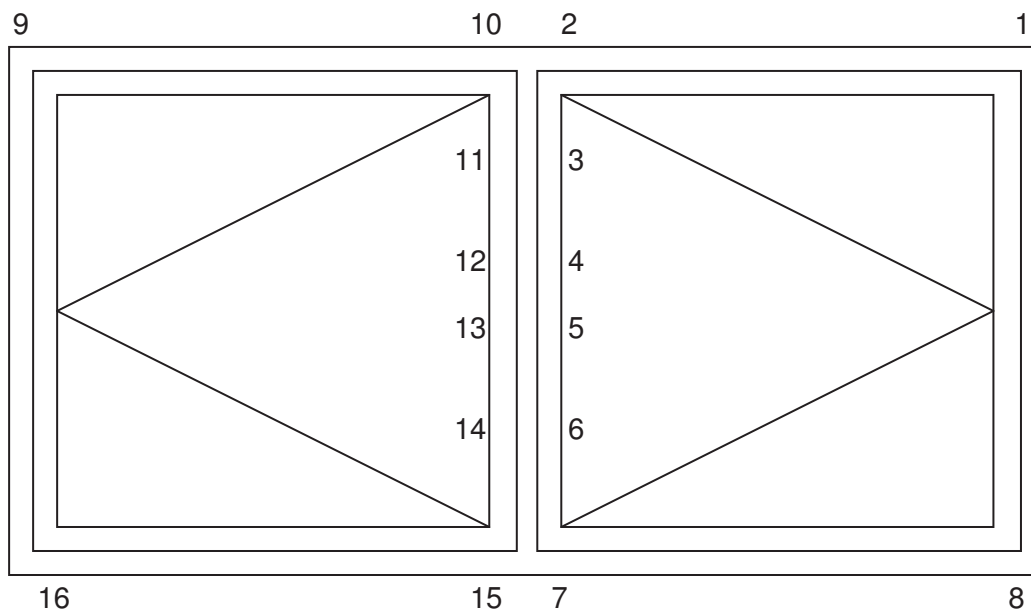
CLAUSE 7 PERFORMANCE REQUIREMENTS

Annex A.6 Mechanical loading test

The sample was mounted vertically in the test rig as described in Annex A.2.

The test was carried out in accordance with the procedures detailed in Annex A.6 and Figure 1 using the test apparatus detailed in Appendix A of this test report.

Diagram of points of application of loads



Annex A.6.2 Loading procedure

Point of application of load (right hand light)

First sequence

1 - Hinge protector/Friction stay (right head)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN towards opposite stay

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

EXAMINATION AND TEST (CONTINUED)

ASSESSMENT

Annex A.6.2 Loading procedure

Point of application of load

2 - Corner (mullion head)

Standard loading case used: 3

Load applied in plane: 1.0kN along edge in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

3 - Mushroom bolt/Mushroom bolt (upper mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

4 - Mushroom bolt (centre mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

5 - Mushroom bolt (centre mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

EXAMINATION AND TEST (CONTINUED)

ASSESSMENT

Annex A.6.2 Loading procedure

Point of application of load

6 - Mushroom bolt/Mushroom bolt (lower mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

7 - Corner (mullion sill)

Standard loading case used: 3

Load applied in plane: 1.0kN along edge in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

8 - Hinge protector/Friction stay (right sill)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN towards opposite stay

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

No entry effected

Pass

Point of application of load (left hand light)

9 - Hinge protector/Friction stay (left head)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN towards opposite stay

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

EXAMINATION AND TEST (CONTINUED)

ASSESSMENT

Annex A.6.2 Loading procedure

Point of application of load

10 - Corner (mullion head)

Standard loading case used: 3

Load applied in plane: 1.0kN along edge in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

11 - Mushroom bolt/Mushroom bolt (upper mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

12 - Mushroom bolt (centre mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

13 - Mushroom bolt (centre mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

EXAMINATION AND TEST (CONTINUED)

ASSESSMENT

Annex A.6.2 Loading procedure

Point of application of load

14 - Mushroom bolt/Mushroom bolt (lower mullion)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

1.0kN at the mullion to oppose the above load

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

15 - Corner (mullion sill)

Standard loading case used: 3

Load applied in plane: 1.0kN along edge in direction to disengage nearest locking point

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

16 - Hinge protector/Friction stay (left sill)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN towards opposite stay

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

No entry effected

Pass

Annex A.7 Manual check test

The sample was mounted vertically in the test rig as described in Annex A.2.

The test was carried out using the tools described in Annex A.7.2 in accordance with the procedures detailed in Annex A.7.3.

No alternative method of entry could be effected

Pass

Annex A.8 Additional mechanical loading test

Not applicable as an alternative method of entry was not identified under Annex A.7.

DESCRIPTION OF SAMPLE (Sample 2)

Sample type - Projecting top hung

Material - Aluminium

Construction - Cleated

Fittings - Friction stays: 16" Securistyle Defender side hung stays
Locking: a six point lock (six mushroom bolts) Trojan reverse espagnolette system operated by a key locking handle
4 of run up blocks
2 of pairs of Vector Excluder hinge protectors

Glass - Double glazed, 4-20-4mm toughened glass sealed unit

Glazing system - Internal beads and gaskets

Sample dimensions - For information only (nominal sizes)
Overall size
Length: 1455mm Height: 1270mm
Sash sizes
Length: 1400mm Height: 1200mm

EXAMINATION AND TEST

Sample type - Projecting top hung

Date of test – 6 February 2012

Laboratory temperature – 19.1 °C

CLAUSE 7 PERFORMANCE REQUIREMENTS

ASSESSMENT

Annex A.4 Manipulation test

The sample was mounted vertically in the test rig as described in Annex A.2. The test was carried out in accordance with the given objective of this Annex using the implements described in Annex A.3.

The key for the lockable hardware was fully removable.
No entry could be effected within 3 minutes.

Pass

Annex A.5 Glazing removal test

Annex A.5.1 Manual test

The sample was mounted vertically in the test rig as described in Annex A.2. The sample was assessed using a selection of tools as described in Annex A.3.

No entry could be effected within 3 minutes

Pass

Annex A.5.2 Mechanical test

The sample was mounted vertically in the test rig as described in Annex A.2. A perpendicular to plane load of 2.0kN was applied to each corner of the glazing in turn as specified in Annex A.5.2.

No evidence of bead failure
No entry could be effected

Pass

EXAMINATION AND TEST (CONTINUED)

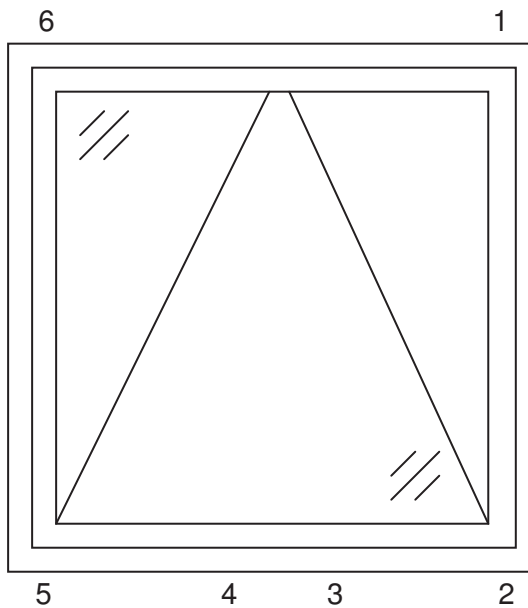
CLAUSE 7 PERFORMANCE REQUIREMENTS

Annex A.6 Mechanical loading test

The sample was mounted vertically in the test rig as described in Annex A.2.

The test was carried out in accordance with the procedures detailed in Annex A.6 and Figure 1 using the test apparatus detailed in Appendix A of this test report.

Diagram of points of application of loads



Annex A.6.2 Loading procedure

Point of application of load

First sequence

1 - Hinge protector/Friction stay (right head)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN towards opposite stay

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

EXAMINATION AND TEST (CONTINUED)

ASSESSMENT

Annex A.6.2 Loading procedure

Point of application of load

2 - Corner/Mushroom bolt/Mushroom bolt (right sill)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

3 - Mushroom bolt (centre sill)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

4 - Mushroom bolt (centre sill)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

5 - Corner/Mushroom bolt/Mushroom bolt (left sill)

Standard loading case used: 4

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN along edge in direction to disengage bolt

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Loads applied in plane: 1.0kN at right angles to edge and towards opposite edge

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

EXAMINATION AND TEST (CONTINUED)

ASSESSMENT

Annex A.6.2 Loading procedure

Point of application of load

6 - Hinge protector/Friction stay (left head)

Standard loading case used: 5/1

Load applied in plane: 1.0kN in direction to disengage hinge protector

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

Load applied in plane: 1.0kN towards opposite stay

Load applied perpendicular to plane: 3.0kN applied for 10 seconds

No entry effected

Pass

Annex A.7 Manual check test

The sample was mounted vertically in the test rig as described in Annex A.2.

The test was carried out using the tools described in Annex A.7.2 in accordance with the procedures detailed in Annex A.7.3.

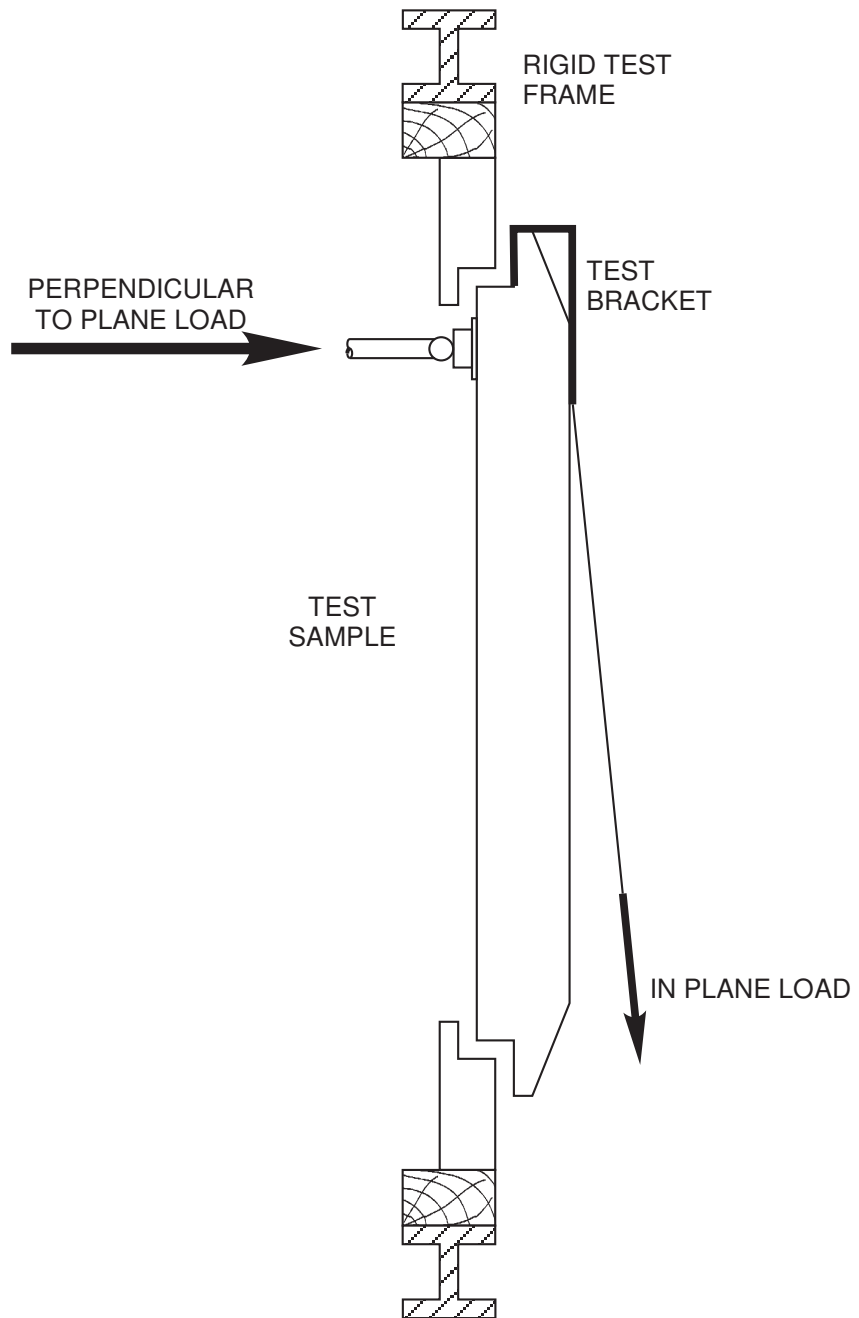
No alternative method of entry could be effected

Pass

Annex A.8 Additional mechanical loading test

Not applicable as an alternative method of entry was not identified under Annex A.7.

APPENDIX A

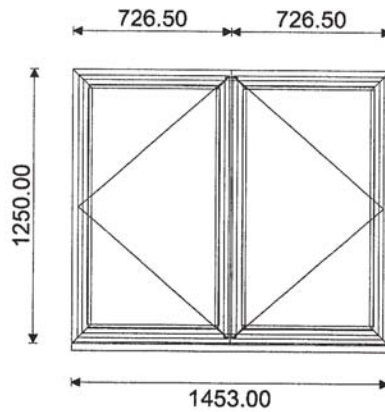


APPENDIX B

2

Casemen

ETC317: Outer Frame
ETC424: Vent
ETC335: Mullion
ETC157: Cill
NONE: Head Extension



1,453 mm x 1,275 mm ✓

QUALITY CONTROL	
Approved	
Cut	
Fabricated	
Checked	
Glazed	

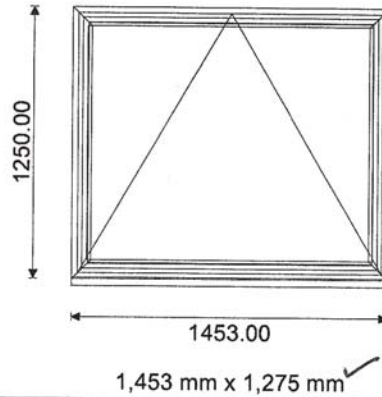
Extrusions		End Prep	Qty	Total	Length	Status
ETC157	Cill - 150mm SubCill	0.0T 0.0T	1	2	1,453 mm	[]
ETC162	Bead - 24mm (ALI47) Square	0.0T 0.0T	4	8	600 mm	[]
ETC162	Bead - 24mm (ALI47) Square	0.0T 0.0T	4	8	1,075 mm	[]
ETC317	Square Outerframe for Standard Stays	45.0T 45.0T	2	4	1,250 mm	[]
ETC317	Square Outerframe for Standard Stays	45.0T 45.0T	2	4	1,453 mm	[]
ETC335	Wide Transom/Mullion for STD Stays	0.0T 0.0T	1	2	1,185 mm	[]
ETC424	Internally Beaded Square Vent Frame	45.0T 45.0T	4	8	692 mm	[]
ETC424	Internally Beaded Square Vent Frame	45.0T 45.0T	4	8	1,197 mm	[]
Glazing			Qty	Total	Width	Height
28MM	28mm Glazing		2	4	593 mm	x 1,098 []
Components			Qty	Total	Unit	
ACET012	CornerCleat (Crimping cleat)		4	8	Each	[]
ACET044	Chevron S/S (for 55)		8	16	Each	[]
ACET045	Chevron S/S (for 47)		8	16	Each	[]
ACET062	Screws (for Cills) No.10 x 2 CskSS STap		6	12	Each	[]
ACET064	Screws (for Handles) No. 8 X5/8 Csk Hd.		24	48	Each	[]
ACET066	Screws No. 7 x 1.5 Csk head S/S		6	12	Each	[]
ACET069	Screws (for ACET081)		4	8	Each	[]
ACET070	8X 1/2 " Pozi Flange S.S. Self Tapping		24	48	Each	[]
ACET074	CornerCleat (Crimping for 47 Internal)		8	16	Each	[]
ACET125	Anti Twist Clip		2	4	Each	[]
ACET157WP	Cill end cap		1	2	Each	[]
ACET165WPL	Espag Handle Left - White		1	2	Each	[]
ACET165WPR	Espag Handle Right - White		1	2	Each	[]
ACET180	Alitherm 47 - Run up block for direct fix to		4	8	Each	[]
ACET304L	Espag'		1	2	Each	[]
ACET304R	Espag'		1	2	Each	[]
ACET310	Cleat for ETC310 316 317		4	8	Each	[]
ACET335	PVC Transom Locator Block for ETC335		2	4	Each	[]
ACET380	Run Up Block		2	4	Each	[]
ACET394	Keep Packer		4	8	Each	[]
ACINDSSH16	16" SH. Standard Hinge		2	4	Each	[]
ACVG31	Gasket - E Gasket 3mm		7	14	Each	[]
ACVG34	Gasket - Wedge Gasket 5mm		7	14	Each	[]
ACVL032	Gasket - Small Flipper		15	30	Each	[]
ACW20024	Stainless Steel Chevron		8	16	Each	[]
HINGE PROTE	Hinge Protectors (Pr)		4	8	Each	[]

APPENDIX B (CONTINUED)

1

Casemen

ETC317: Outer Frame
ETC424: Vent
ETC157: Cill



QUALITY CONTROL	
Approved	
Cut	
Fabricated	
Checked	
Glazed	

<i>Extrusions</i>		<i>End Prep</i>		<i>Qty</i>	<i>Total</i>	<i>Length</i>	<i>Status</i>
ETC157	Cill - 150mm SubCill	0.0T	0.0T	1	2	1,453 mm []	
ETC162	Bead - 24mm (ALI47) Square	0.0T	0.0T	2	4	1,075 mm []	
ETC162	Bead - 24mm (ALI47) Square	0.0T	0.0T	2	4	1,308 mm []	
ETC317	Square Outerframe for Standard Stays	45.0T	45.0T	2	4	1,250 mm []	
ETC317	Square Outerframe for Standard Stays	45.0T	45.0T	2	4	1,453 mm []	
ETC424	Internally Beaded Square Vent Frame	45.0T	45.0T	2	4	1,197 mm []	
ETC424	Internally Beaded Square Vent Frame	45.0T	45.0T	2	4	1,400 mm []	
<i>Glazing</i>				<i>Qty</i>	<i>Total</i>	<i>Width</i>	<i>Height</i>
28MM	28mm Glazing			1	2	1,301	x 1,098 []
<i>Components</i>				<i>Qty</i>	<i>Total</i>	<i>Unit</i>	
ACET012	CornerClead (Crimping cleat)			4	8	Each	[]
ACET044	Chevron S/S (for 55)			4	8	Each	[]
ACET045	Chevron S/S (for 47)			8	16	Each	[]
ACET062	Screws (for Cills) No.10 x 2 CskSS STap			6	12	Each	[]
ACET069	Screws (for ACET081)			2	4	Each	[]
ACET070	8X 1/2 " Pozi Flange S.S. Self Tapping			12	24	Each	[]
ACET074	CornerClead (Crimping for 47 Internal)			4	8	Each	[]
ACET157WP	Cill end cap			1	2	Each	[]
ACET165WPR	Espag Handle Right - White			1	2	Each	[]
ACET180	Alitherm 47 - Run up block for direct fix to			2	4	Each	[]
ACET305R	Espag			1	2	Each	[]
ACET310	Clead for ETC310 316 317			4	8	Each	[]
ACET380	Run Up Block			2	4	Each	[]
ACET394	Keep Packer			4	8	Each	[]
ACINDS24	24" Standard Hinge			1	2	Each	[]
ACVG31	Gasket - E Gasket 3mm			5	10	Each	[]
ACVG34	Gasket - Wedge Gasket 5mm			5	10	Each	[]
ACVL032	Gasket - Small Flipper			10	21	Each	[]
ACW20024	Stainless Steel Chevron			4	8	Each	[]
HINGE PROTE	(Hinge Protectors (Pr)			2	4	Each	[]

END OF REPORT

bre

**Weathertightness test to
BS 6375: Part 1: 2009 on
a Smart Architectural
Aluminium Alitherm 600
externally glazed
window**

Prepared for: Mr. D. White

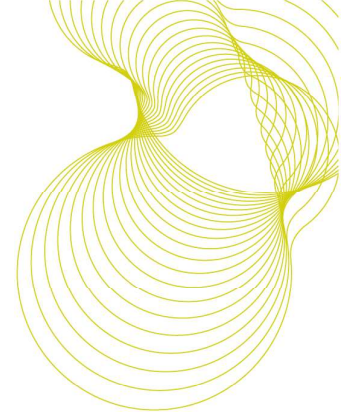
Smart Architectural Aluminium

26 November 2012

Test report number 282473-1



0578



Tested on behalf of BRE by:

Name Malcolm Pound
Position Senior Consultant and Laboratory Manager, Construction, Building Technology
Date 12 November 2012

Signature _____

Prepared on behalf of BRE by:

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Approved on behalf of BRE

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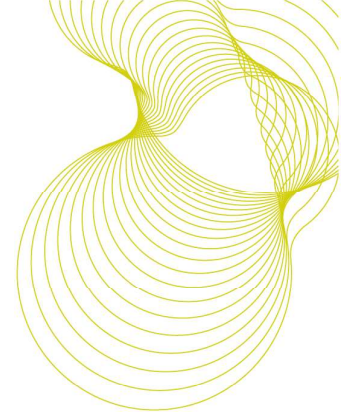
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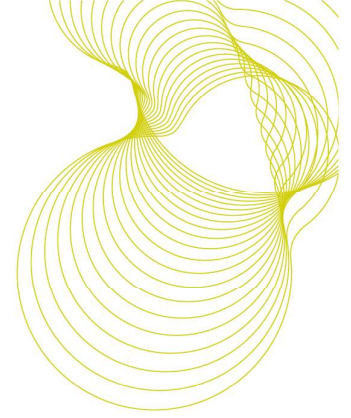
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1 Introduction

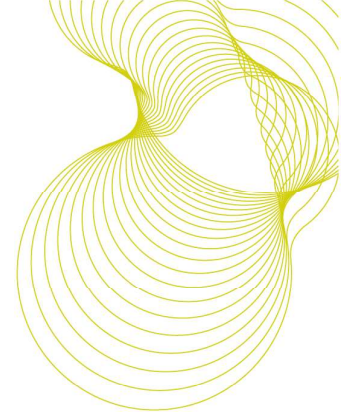
At the request of Mr. D. White of Smart Architectural Aluminium, Technical Department, Arnolds Way, Yatton, Bristol, North Somerset, BS49 4QN, BRE issued proposal number 132241 on 21 September 2012. The proposal was accepted on 26 September and BRE tested a specimen Alitherm 600 window on the 12 November 2012.

The tests to methods in BS 6375: Part 1: 2009, BS EN 1026¹, 1027² and 12211³ measure the weathertightness of the specimen in terms of air permeability, watertightness and resistance to wind load respectively. Classification of the results is based on BS 6375: Part 1: 2009⁴ and BS EN 12207⁵, 12208⁶, 12210⁷.

The tests on the specimen were carried out by Mr. M. C. Pound under the BRE Standard Terms and Conditions of Business for testing and to the UKAS BRE Specific Procedures Series F, as BRE Job number 282473 in project number CV5692. The tests were witnessed by:

Mr. D. White Technical Department, Smart Architectural Aluminium.

Mr. M. Walford Technical Department, Smart Architectural Aluminium.



2 Details of tests carried out

BS 6375: Part 1: 2009 specifies that the air permeability test is performed under both positive and negative test pressures and that the average of the measurements defines the results. It also specifies that water tightness test method A is used and that deflections measured during the resistance to wind load test do not exceed 1/150 of the span. The weathertightness test comprised of three parts in the sequence:

1. Air permeability to BS EN 1026: 2000; by application of a series of test air pressure differentials across the specimen with measurement of the air permeability of it at each pressure step. The maximum positive and negative pressure differential was 600 Pa reached in pressure steps of 50, 100, 150, 200, 250, 300, 450 and 600 Pa.
2. Watertightness to BS EN 1027: 2000; by applying specified amounts of water spray to the outside face of the specimen while incrementally increasing the air pressure differential across it. The test pressure, time and position of any water penetration are recorded. The maximum positive air pressure differential was 1200 Pa. Pressure (Pa)/time (min) steps were 0/15, 50/5, 100/5, 150/5, 200/5, 250/5, 300/5, 450/5, 600/5, 750/5, 900/5, 1050/5 and 1200/5.
3. Resistance to wind load to BS EN 12211: 2000; by application of a series of positive and negative test air pressures. Measurements and inspections are made to assess relative frontal deflection and resistance to damage from wind loads.

The resistance to wind load test includes a deflection test, a repeated pressure test and operational test, an air permeability test and finally a safety test. For the purpose of the resistance to wind load test three test pressures are defined:

P1 applied to measure the deflections of parts of the test specimen.

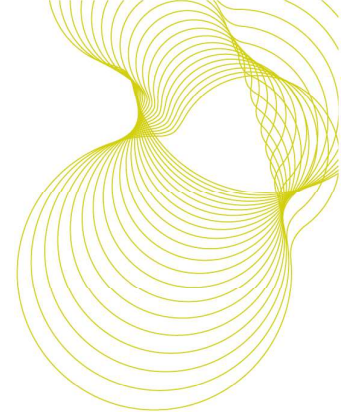
P2 50 cycles of pulsating pressure to assess performance under repeated wind loads.

P3 applied to assess the safety of the test specimen under extreme conditions.

The values of P1, P2 and P3 are related as follows: $P2 = 0.5P1$, $P3 = 1.5P1$.

For these tests the values are: $P1 = 2400$ Pa, $P2 = 1200$ Pa and $P3 = 3600$ Pa.

Note: The repeat air permeability test is an integral part of the resistance to wind load test and its significance is as an indicator of damage that may occur during that test.



3 Classification of results

BS 6375: Part 1: 2009 classifies the results for products in the UK. For a window to be included in an exposure category the appropriate test pressures for air permeability, watertightness and resistance to wind shall be attained or exceeded. The relevant product standard BS EN 14351-1:2006⁸ also states that classification of air permeability is based on the averages of the positive and negative air leakage values at each pressure step.

The specimen was tested to a UK exposure category of 2000+ (2400 Pa). The classifications set in BS 6375: Part 1: 2009 for a UK exposure category of 2000+ for windows are: Air permeability at Class 2/300 Pa or Classes 3 and 4 when tested to 600 Pa, water tightness at Class 7A/300 Pa and resistance to wind load at Class A4 at P1 2400 Pa, P2 1200 Pa and P3 3600 Pa.

When averages of the measurements of air permeability per square metre and length of the opening joints on the specimen give rise to adjacent air permeability classes then the specimen shall be classified in the most favourable class (according to BS EN 12207 Clause 4.6).

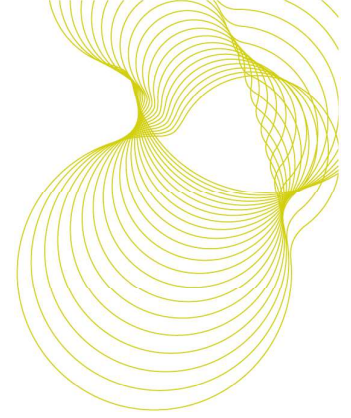
The BS EN classifications are explained below:

Air permeability: BS EN 12207: 1999. The classification is based on a comparison of the air permeability of the test specimen related to both overall area and length of opening joint. There are four classes; Class 4 is applicable to the most airtight specimens while Class 1 describes those with most air leakage. To meet any class the measured air permeability of the specimen must not exceed the upper limit at any test pressure step in that class.

Watertightness: BS EN 12208: 2000. The classification is based on a comparison of the watertightness of the test specimen related to test pressures and duration of the test. There are nine classes; 1A/1B up to 9A for test pressures from 0 Pa to 600 Pa. For specimens that remain watertight over 600 Pa for 5 minutes a class Exxx is used. The xxx is the maximum test pressure e.g. 750 Pa. To meet any class the specimen must remain watertight for 5 minutes up to and at the test pressure set for that class.

Resistance to wind load: BS EN 12210: 1999. The classification is based on a comparison of the resistance to wind loads of the test specimen when subjected to test pressures P1, P2 and P3. There are five classes; 1 up to 5 for P1 test pressures from 400 Pa to 2000 Pa. For specimens that are tested to P1 pressures exceeding 2000 Pa a class Exxxx is used. The xxx is the actual test pressure P1 used e.g. 2400 Pa. To achieve any class the resistance of the specimen to wind load must meet all the requirements for that class.

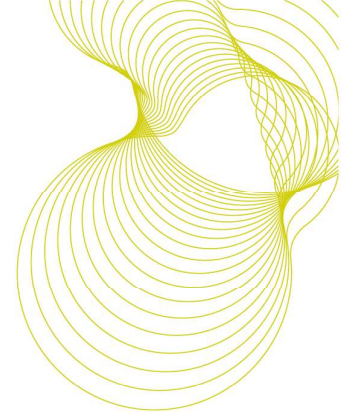
Note: This report has results for air permeability under positive and negative test pressures and a graph showing the average air permeability for them at each pressure step.



4 Test specimen

The general details about the test specimen supplied by Smart Architectural Aluminium for these tests are given below:

- Type:** Aluminium frame members with one side hung and one top hung opening lights and one fixed light. Reference: Smart Systems Alitherm 600; specimen is 1600 mm wide x 1200 mm high. Drawings and photographs in the Annex of this report show cross sections of the frame members and window details.
- Subsill:** A sub sill is fitted to the window for tests.
- Frame:** Aluminium sections.
- Glazing:** The lights are all glazed externally with insulating glass units with 4 mm thick toughened glass, a 20 mm wide air gap and 4 mm thick toughened glass. Aluminium snap-in beads retain the glazing and the glazing seals.
- Seals:** Side and top hung lights: Compression type seals on the window and light frames. The fixed light has glazing seals.
- Hardware:** Trojan reverse espagnolette locking system with six locking points on the side hung light and four on the top hung light. Both opening lights have stainless steel Securistyle hinges.
- Drainage:** There are two holes in the underside of the bottom rails on the side and top hung lights. Water drains to holes in the nose of the sub sill. There is a weather moulding at the head of the window over the full width of the lights.
- Fixings:** For these tests the specimen was fixed with screws and sealed into a timber surround frame.
- Dimensions:** 1600 mm wide x 1200 mm high (overall). Area: 5.84 m²
- Length of opening joint = 1.92 m



5 Test rig and preparatory procedures

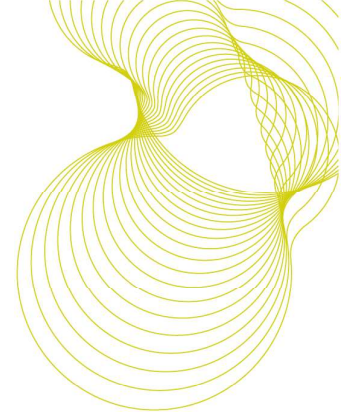
The test specimen was conditioned for at least 4 hours within temperature and humidity ranges specified in the test standards of 10°C to 30°C and 25% to 75% RH respectively.

The water temperature in the watertightness test was within the specified range of 4°C to 30°C.

The specimen was mounted in the BRE test rig 'G', to form one wall of a pressure box, with the outdoor face enclosed in the box.

A spray bar with four full circular cone nozzles was mounted in the pressure box to apply water to the outside face of the specimen. The water flow rate per nozzle was 2 L/min in accordance with BS EN 1027 spraying method 1A.

Transducers were mounted on independent supports to measure deflections of a frame member. Deflections were measured on the span at the positions indicated in Figure A3.

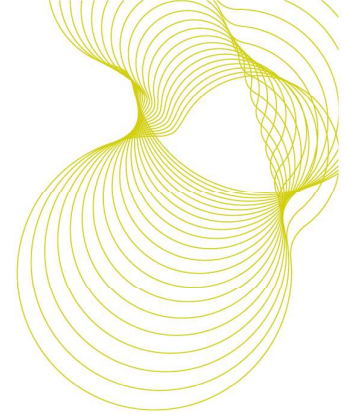


6 Summary of test results

The test results are summarised in Table 1 below. Figures show detail of the Alitherm 600 externally glazed window and detailed results are given in Annex A.

BS	Air permeability		Watertightness		Resistance to wind loads	
	Requirements	Results	Requirement	Results	Requirements	Results
BS 6375	Class 3 or 4 to 600 Pa	Met the requirements of Class 4 for the average of positive and negative test results	Class 7A at 300 Pa	Class E1200 at 1200 Pa Met & exceeded Class 5A	Class AE2400 P1 = 2400 Pa P2 = 1200 Pa P3 = 3600 Pa	Met all of the requirements for Class AE2400

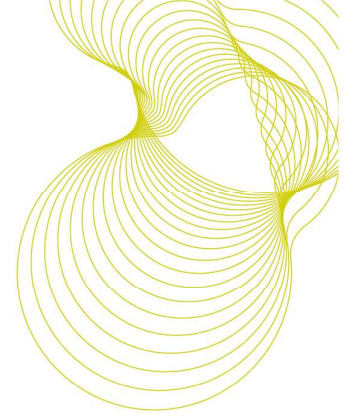
Table 1. Summary of weathertightness test results



7 Conclusions

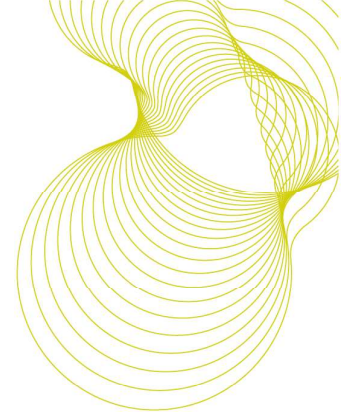
When the specimen Smart Architectural Aluminium Alitherm 600 externally glazed window 1600 mm wide x 1200 mm high was tested to the standards described herein to UK exposure category '2000+' (2400 Pa) it was found to be:

- Sufficiently airtight to attain Class 4 based on the averages of results under positive and negative test pressures thus meeting the BS 6375: Part 1: 2009 requirements for Class 4 at 600 Pa.
- Resistant to water penetration using method 1A to Class E1200A up to and at 1200 Pa thus meeting and exceeding the BS 6375: Part 1: 2009 requirements for Class 7A at 300 Pa.
- Resistant to wind loads of ± 2400 Pa causing deflections less than 1/150 of the span of a frame member. Resistant to repeated pressure cycles of ± 1200 Pa and able to sustain the corresponding safety test pressure of ± 3600 Pa. The overall classification for resistance to wind load is Class AE2400 thus meeting the requirements of BS 6375: Part 1: 2009.
- The externally glazed Alitherm 600 window specimen meets all the criteria for a UK exposure category of 2000+ (2400 Pa).



8 References

1. BS EN 1026: 2000. Windows and doors – Air permeability – Test method. British Standards Institution, London.
2. BS EN 1027: 2000. Windows and doors – Watertightness – Test method. British Standards Institution, London.
3. BS EN 12211: 2000. Windows and doors – Resistance to wind load – Test method. British Standards Institution, London.
4. BS 6375: Part 1: 2009. Performance of windows and doors – Classification for weathertightness and guidance on selection and specification
5. BS EN 12207: 2000. Windows and doors – Air permeability - Classification. British Standards Institution, London.
6. BS EN 12208: 2000. Windows and doors – Watertightness - Classification. British Standards Institution, London.
7. BS EN 12210: 2000. Windows and doors – Resistance to wind load - Classification. British Standards Institution, London.
8. BS EN 14351-1:2006 Windows and doors – Product standard. British Standards Institution, London.



ANNEX A. Weathertightness test results

Pressure differential Pa	Air flow through the specimen m ³ /h	Air flow per unit area of the specimen m ³ /h.m ²	Air flow per m of opening joint on the specimen m ³ /h.m
50	0.24	0.13	0.04
100	0.35	0.18	0.06
150	0.82	0.43	0.14
200	1.26	0.66	0.22
250	1.67	0.87	0.29
300	1.93	1.00	0.33
450	2.40	1.25	0.41
600	2.87	1.49	0.49

Table A1. Air permeability under positive air pressure; test results

Pressure differential Pa	Air flow through the specimen m ³ /h	Air flow per unit area of the specimen m ³ /h.m ²	Air flow per m of opening joint on the specimen m ³ /h.m
50	0.41	0.21	0.07
100	0.75	0.39	0.13
150	1.27	0.66	0.22
200	1.66	0.86	0.28
250	2.12	1.11	0.36
300	2.53	1.32	0.43
450	3.34	1.74	0.57
600	4.35	2.27	0.74

Table A2. Air permeability under negative air pressure; test results

Pressure differential Pa	Average air flow per unit area of the specimen m ³ /h.m ²	Average air flow per m of opening joint on the specimen m ³ /h.m
50	0.17	0.06
100	0.29	0.10
150	0.55	0.18
200	0.76	0.25
250	0.99	0.33
300	1.16	0.38
450	1.50	0.49
600	1.88	0.62

Table A3. Averages of air permeabilities under positive and negative air pressures; test results

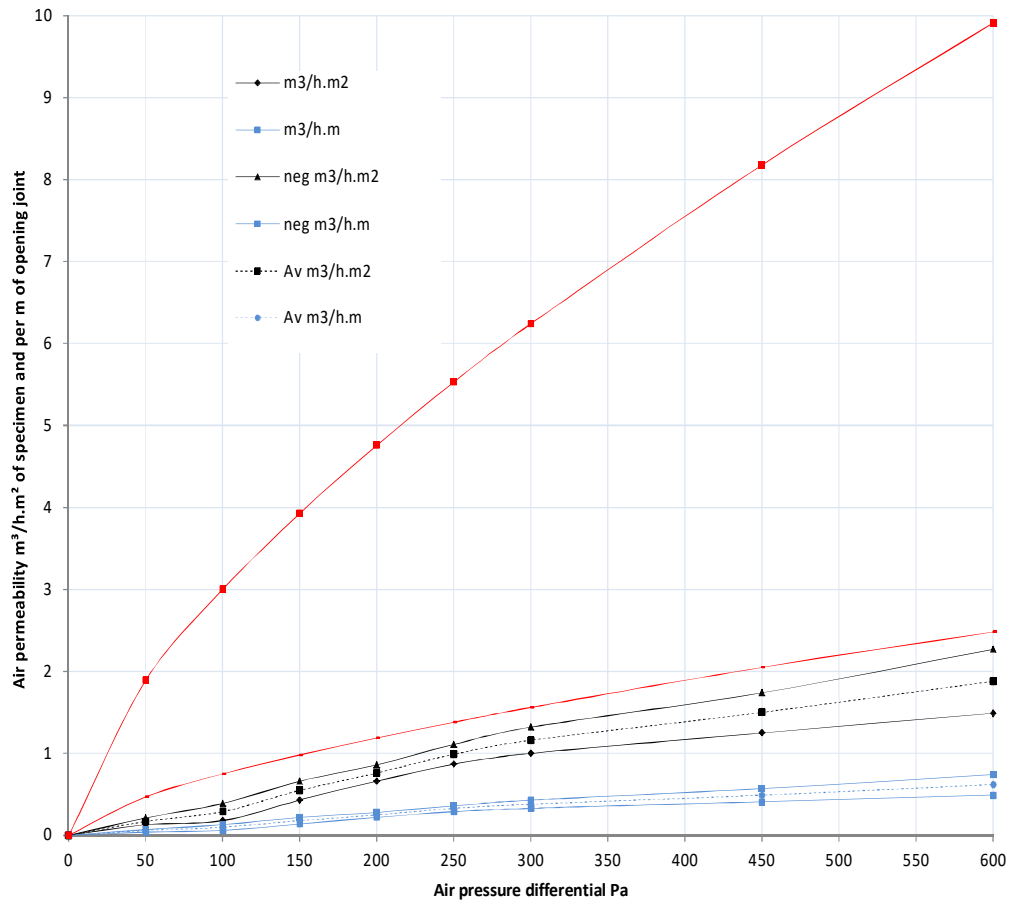
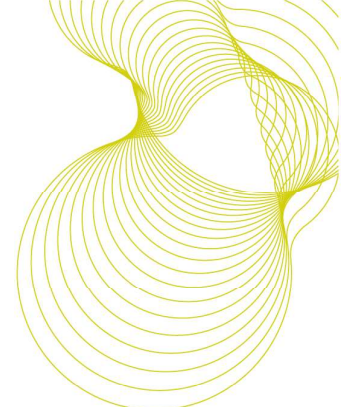
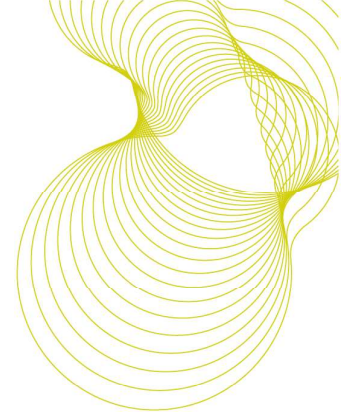


Figure A1. Test results: Air permeability under positive and negative air pressure; showing limits and averages of air permeabilities measured under positive and negative test pressures



Watertightness test

Pressure differential Pa	Duration Minutes	Water leaks
0	15	Nil
50	5	Nil
100	5	Nil
150	5	Nil
200	5	Nil
250	5	Nil
300	5	Nil
450	5	Nil
600	5	Nil
750	5	Nil
900	5	Nil
1050	5	Nil
1200	5	Nil

Test laboratory conditions: Air temperature 18.9°C. Test chamber air temperature 18.7°C
Air pressure 1012 mb. Relative humidity 45.2% at 18.9°C. Water temperature 16.3°C

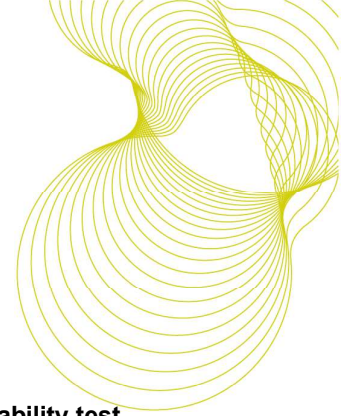
Table A4. Watertightness test results

Resistance to wind load – Deflection test at ± 2400 Pa

Position deflection measured	Positive pressure P1 to +2400 Pa		Negative pressure P1 to -2400 Pa	
	Deflection		Deflection	
	mm	defl./span	mm	defl./span
Centre mullion	1.65	1/649	1.99	1/538

Note: The deflection at the mid-point of a member is measured relative to its ends, e.g. with reference to Figure A3: Deflection at the mid-point = deflection at the mid-point – average of deflections at the two ends of the same member.

Table A5. Deflections measured on a frame member in the resistance to wind load test at ±2400 Pa.



Resistance to wind load – Repeated pressure test including the second air permeability test

Repeated pressure	Damage or functional defects
50 cycles to P2 at ± 1200 Pa	None

Table A6. Damage or functional defects after repeated pressures to P2 at ± 1200 Pa

Second air permeability test under positive air pressures (part of resistance to wind load test)

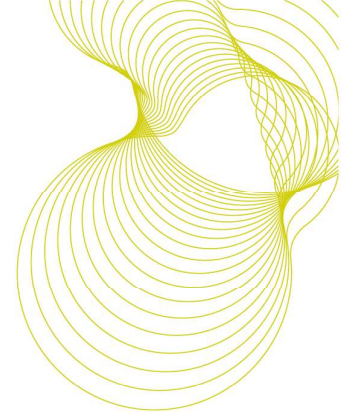
Pressure differential Pa	Air flow through the specimen m^3/h	Air flow through specimen measured at first air permeability test m^3/h	Comparison to the air permeability measured previously (see Table A1)
50	0.24	0.44	After the test pressures P1 and P2 were applied the amounts of air flowing through the test specimen were not significantly different to those measured previously
100	0.35	0.37	
150	0.82	0.86	
200	1.26	1.31	
250	1.67	1.71	
300	1.93	2.03	
450	2.40	2.66	
600	2.87	2.89	

Table A7. Second air permeability test results under positive air pressures

Second air permeability test under negative air pressures (part of resistance to wind load test)

Pressure differential Pa	Air flow through the specimen m^3/h	Air flow through specimen measured at first air permeability test m^3/h	Comparison to the air permeability measured previously (see Table A2)
50	0.41	0.77	After the test pressures P1 and P2 were applied the amounts of air flowing through the test specimen were not significantly different to those measured previously
100	0.75	0.38	
150	1.27	0.97	
200	1.66	2.09	
250	2.12	1.89	
300	2.53	2.23	
450	3.34	2.80	
600	4.35	3.60	

Table A8. Second air permeability test results under negative air pressures



Resistance to wind load - Safety test

Safety test	Condition after test
One pressure pulse to pressure: P3 at – then + 3600 Pa	No parts became detached and the test specimen remained closed

Table A9. Condition of the specimen after the safety test to P3 at ± 3600 Pa



Figure A2. The test specimen installed in the BRE 'G' Weathertightness test rig

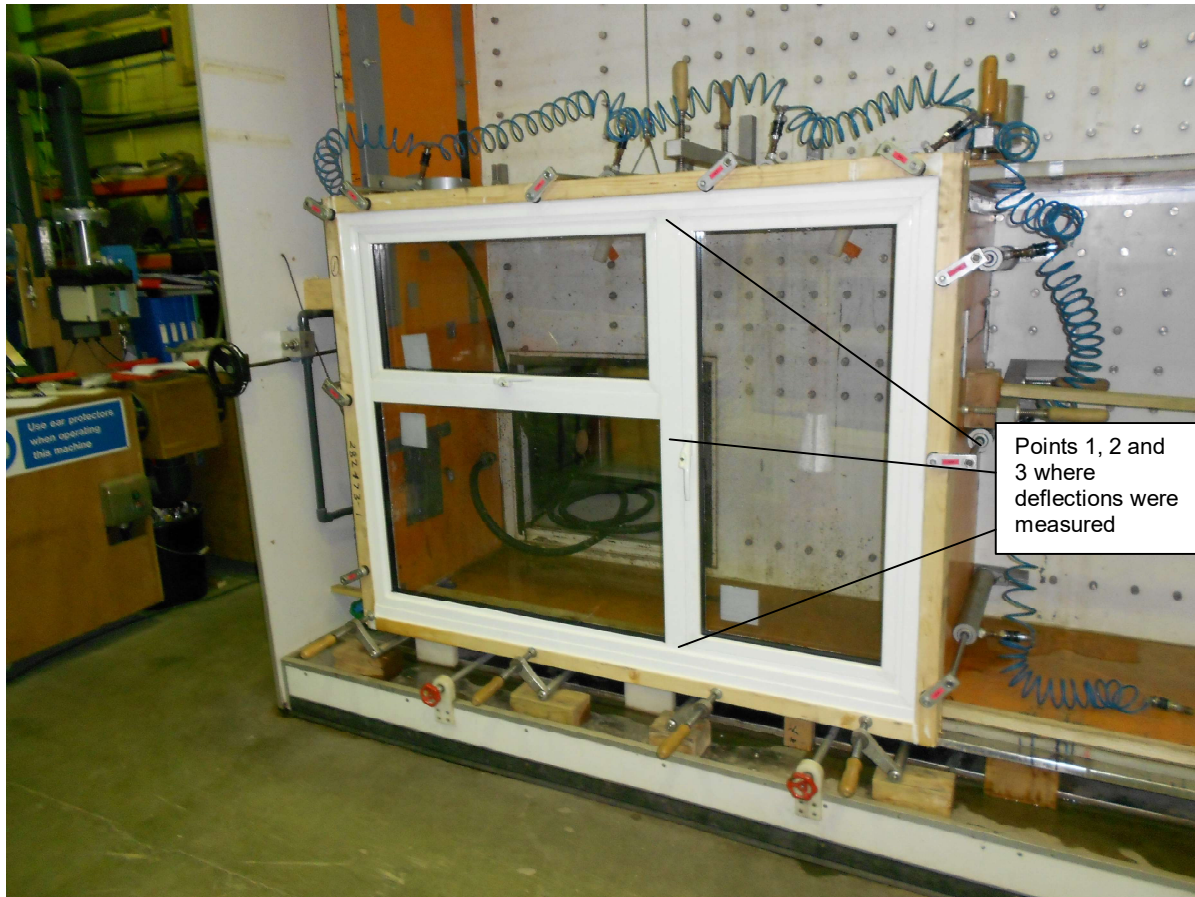
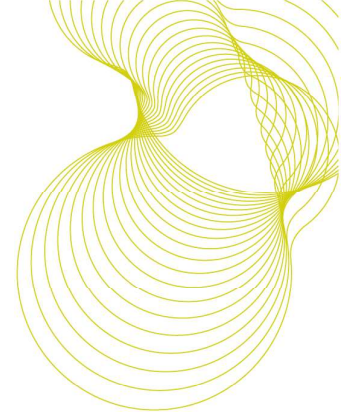
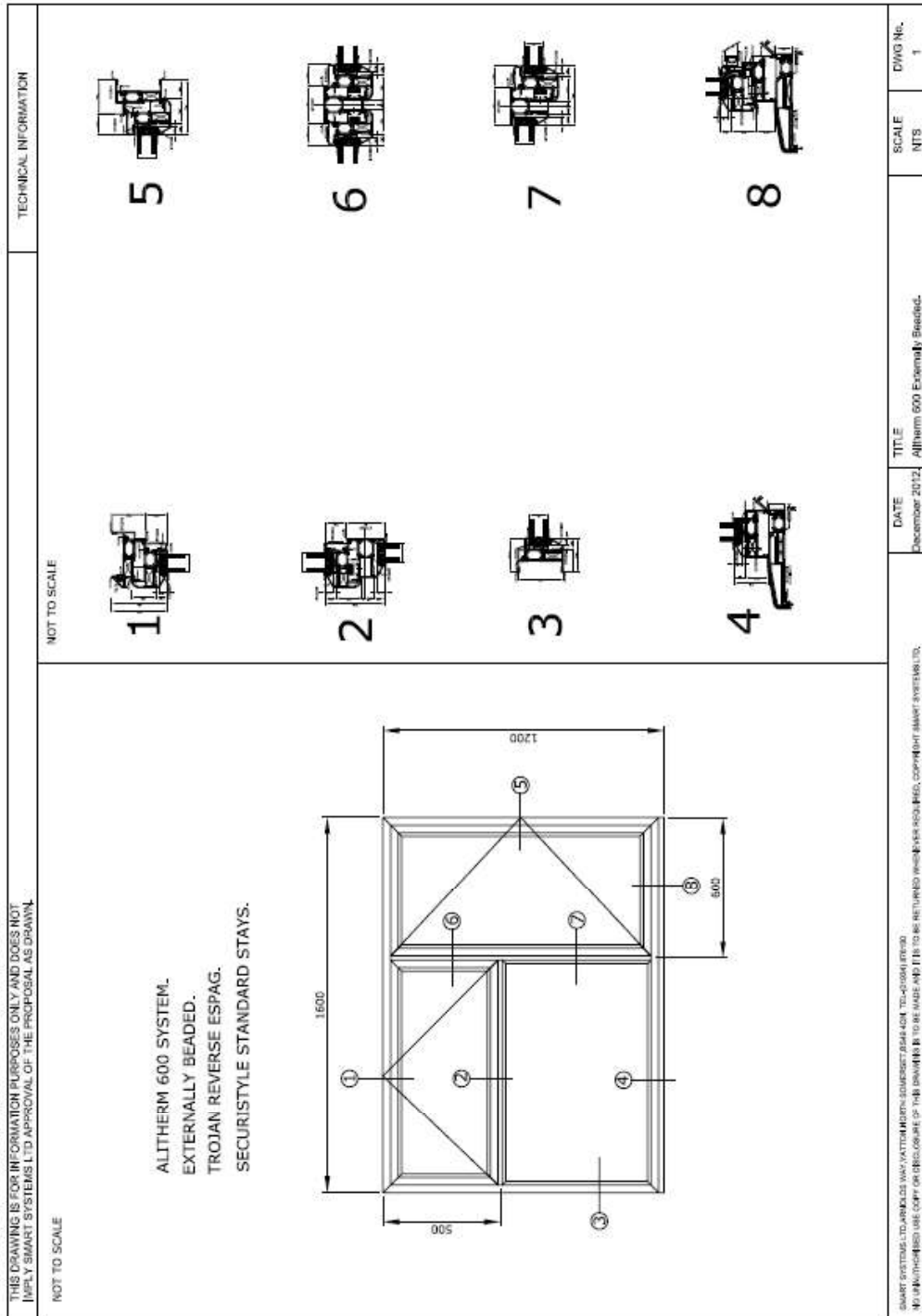
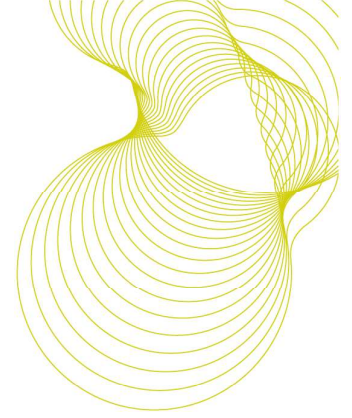


Figure A3. The test specimen showing points 1, 2 and 3 where deflections were measured.

Weathertightness test to BS 6375: Part 1: 2009 on a Smart Architectural Aluminium Alitherm 600 externally glazed window



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