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BRE Global Test Report

EN 13823 Single Burning Item (SBI) test on 140 mm-thick K15

Prepared for: Kingspan Insulation Limited
Date: 01 October 2015
Report Number: P100160-1000-3 Issue 1

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UKAS TESTING
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Date 01 October 2015

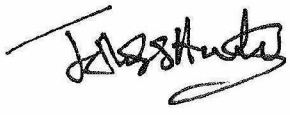
Signature 

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Table of Contents

1 Objective

To assess the performance of the sample described in Section 2 of this report when subjected to the tests specified in EN 13823[1].

2 Sample

2.1 Traceability

The test samples were supplied by the test sponsor. BRE Global was not involved in the sample selection process and therefore cannot comment upon the relationship between the samples supplied for test and the product supplied to market.

2.2 Description of sample and test format

Unless otherwise stated all measurements are nominal

Parameter	Details
Test sponsor	Kingspan Insulation Limited Pembridge Leominster Herefordshire HR6 9LA UK
Manufacturer of sample	Kingspan Insulation Limited - Head Quarters Torvale Industrial Estate Pembridge Leominster Herefordshire HR6 9LA UK
Place of manufacture	Kingspan Insulation Limited Bree Industrial Estate Castleblayney Co. Monaghan Ireland
Trade name	K15
Sample reference	8100143237 1002
Sample description (as provided by test sponsor/manufacturer)	Foil faced phenolic insulation board
Description of sample (as received)	140 mm-thick pinkish-orange rigid foam with perforated foil facings. Both facers appeared identical. The interior face was marked with the blue Kingspan logo.
Test sponsor's product data	
Generic type of product	Closed cell phenolic – foil faced.

Parameter	Details
Nominal thickness (mm)	140 mm
Nominal density (kg/m³)	35 kg/m³
Nominal mass per unit area (kg/m²)	Note 2
Colour	Foil: Silver Glass fibre: Light brown/off-white Insulation: Pink/orange
Flame retardant treatment added or organic content limited during production	No
European product standard, if applicable	EN 13166[2]
Substrate and ventilation conditions	
Substrate	Calcium silicate
Generic type of substrate	Calcium silicate board
Thickness (mm)	12 mm
Nominal density (kg/m³)	870 ± 50 kg/m³
Fire classification	A2-s1, d0 to EN 13501-1[3]
Type of air gap	None
Position of air gap	Not applicable
Measured sample data	
Mean sample density	40.73 kg/m³
Mean sample thickness	139.89 mm
Mean sample mass per unit area	5.70 kg/m²
Test information	
Face to be tested	Foil face
Orientation aspects	Note 1
Test sponsor's sampling identification	Batch No. 8100143237-1002. D.O.M 02.12.2015
BRE Global sample number	E7988
Sample receipt date	20 April 2015
Date into conditioning	20 April 2015
Date of test	28 May 2015 and 29 May 2015
Additional information:	None

Note 1: This information was not supplied by the test sponsor.

Note 2: Note 1: This commercially sensitive information has been withdrawn from the test report at the request of the test sponsor. The information is held in confidence in the laboratory file.

2.3 Description of substrate and fixing

The insulation was mechanically fixed to a calcium silicate substrate, with a nominal dry density of 870 kg/m³ and a nominal thickness of 12 mm, using screws and square plate countersunk washers (50 mm by 50 mm).

A screw was positioned in all four corners of each of the nine pieces that made up the test specimen. In addition, on some test specimens, an additional fixing was positioned in the geometric centre of the panel. The fixings located along the bottom edge of the specimen were positioned above the U-channel. The fixings were passed through the test face of the sample and into the substrate. See pre-test photographs for further details.

2.4 Jointing details

- A vertical joint was incorporated into the long wing of the test specimen, at a distance of 200 mm from the finished face of the short wing.
- A horizontal joint was incorporated into the long wing of the test specimen, at a height of 500 mm from the base of the test specimen.
- A horizontal joint was incorporated into the long wing of the test specimen, at a height of 1200 mm from the base of the test specimen.
- All joints were uncovered butt-joints.

2.5 Mounting technique

The specimens were tested with a calcium silicate backing board laid directly against the rear face of the substrate. A tilted triangular grid, constructed and mounted as specified in clause 4.4.6 f) of EN 13823, was used to protect the main (primary) burner from falling debris.

3 Conditioning

The specimens were conditioned as required by the test standard.

4 Results

4.1 Tabulated data

Table 1

Operator: C. Rock Number of test runs: Three Deviations from test standard: None

Run No.	Data			Mean
Run Number	1	2	3	
$FIGRA_{0.2MJ}$ (W/s)	318.9	285.3	350.6	318.3
$FIGRA_{0.4MJ}$ (W/s)	241.1	150.0	269.0	220.0
SMOGRA (m^2/s^2)	1.2	1.6	0.0	0.9
THR_{600s} (MJ)	3.6	3.0	3.5	3.4
TSP_{600s} (m^2)	33.6	42.8	25.3	33.9
Flaming droplets/particles	No	No	No	
Flaming droplets/particles > 10 s	No	No	No	
LFS reaches edge of specimen	No	No	No	
Data logger filename	S280515a	S280515b	S290515a	

Table 2

Event	Occurrence of event (Yes/No)		
Run Number	1	2	3
Occurrence of a surface flash	No	No	No
Smoke from the specimen not entering the hood during the test	No	No	No
Falling of parts of the specimen	No	No	No
Development of a gap in the corner (mutual fixing of backing boards fails)	No	No	No
Occurrence of one or more conditions which justify an early termination of the test	No	No	No
Distortion (1) or collapse (2) of the specimen	No	No	No
Test duration (s)	1560	1560	1560
Any other event	See observations		

It should be noted that:

Specimens with an average rate of smoke production value, RSP_{av}, of not more than 0.1m^2/s during the total test period or a total smoke production value of not more than 6m^2 over the total test period have a SMOGRA value of zero.

The fire growth rate indices are calculated only for that part of the exposure period in which the threshold levels for $RHR_{av}(t)$ and THR have been exceeded. If one or both threshold values are not exceeded during the exposure period, FIGRA is equal to zero. The threshold value used for $RHR_{av}(t)$ is 3kW. Two different THR threshold values are used, resulting in $FIGRA_{0.2MJ}$ and $FIGRA_{0.4MJ}$.

Values of THR_{600s} and TSP_{600s} refer to a time of 600s after the flame has been applied to the specimen. This is 300s after the start of the test, and therefore represents a time of 900s in the graphs presented below.

The results of a test are not valid for classification purposes when an early termination of the test has occurred.

4.2 Observations

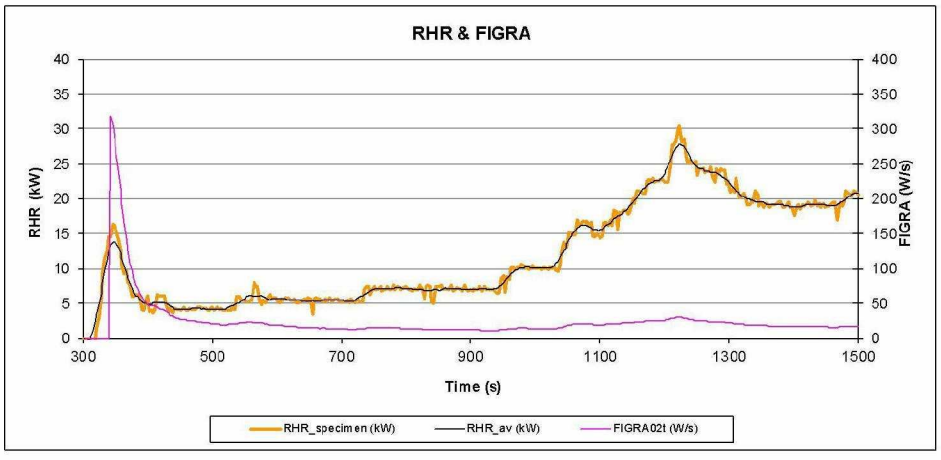
Run	Comments
1	303s: Main burner ignited. 329s: Surface ignition observed. 339s: The flame tips reached the top edge of the test specimen. 348s: The flame front reached the top edge of the test specimen. 387s: The flame front retracted back towards the flame impingement area. Flaming was observed along the vertical and horizontal joints, up to the point where they intersected. 429s: An audible sound was noted. 540s: The composite foil facing started to peel back in the corner area. The flame front reached a height of approximately 1.25 m. Flaming was visible on the exposed face of the insulation core. 960s: A hole formed in the insulation adjacent to the horizontal joint. Flaming was observed along the length of the vertical joint. 1074s: The rate of heat release increased markedly. 1236s: Flames extended above the top edge of the specimen in the corner area and along the vertical joint.
2	302s: Main burner ignited. 321s: Surface ignition observed. 330s: The flame tips reached the top edge of the test specimen. 345s: The flame front reached the top edge of the test specimen. 366s: Smoke issued from the top edge of the test specimen above the burner corner. 387s: The composite foil facing started to flake away in the corner area. 432s: Flaming was observed along the horizontal joint, up to the point where it intersected with the vertical joint. Audible popping sounds were noted. 789s: Flaming was observed along the vertical joint between 0.5 m and 1.0 m. 1230s: The rate of heat release increased markedly. 1368s: Spalling observed. 1416s: Flames extended above the top edge of the vertical joint.
3	303s: Main burner ignited. 327s: Surface ignition observed. 330s: The flame tips reached the top edge of the test specimen. The flame front extended up to a height of approximately 1.0m. 348s: The flame front reached the top edge of the test specimen. 372s: Flaming was observed along the vertical joint between 0.5 m and 1.0 m. 408s: Flaming was observed along the horizontal joint, up to the point where it intersected with the vertical joint. Audible popping sounds were noted 456s: The composite foil facing started to peel back in the corner area. 489s: The rate of heat release increased markedly. 1224s: Flaming was observed along the vertical joint to a height of approximately 1.25 m. 1293s: Flames extended above the top edge of the specimen in the corner area.

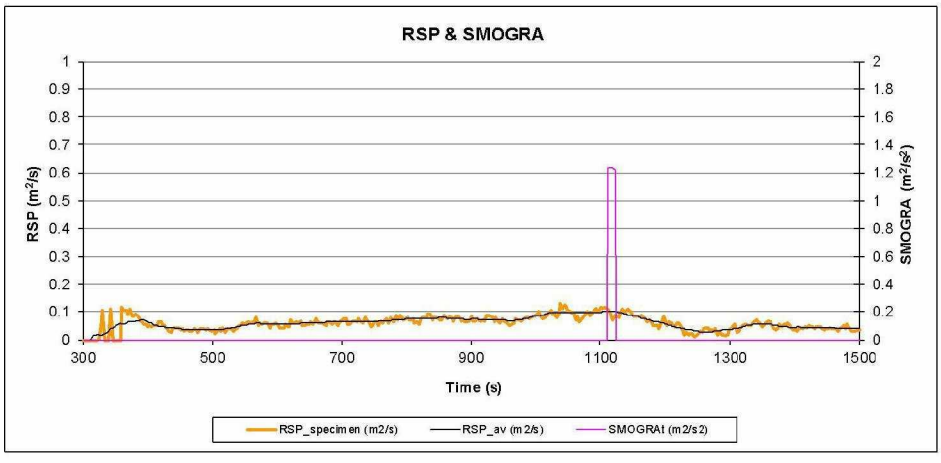
4.3 Graphical outputs

EN 13823 test

BRE Global

	Product identification	140 mm K15		
	Specimen No.	E7988	$FIGRA_{02}$ (W/s)	318.9
	Test date	28 May 2015	$FIGRA_{04}$ (W/s)	241.1
	Operator	C. A. Rock	THR_{600s} (MJ)	3.6
Laboratory:	Filename	s280515a.rw2	SMOGRA (m^2/s^2)	1.2
BRE Global	Test report number	P100160-1000-3	TSP_{600s} (m^2)	33.6





K_t (-)	0.886	RHR_{av_burner} (kW)	31.8182
K_p (-)	1.08	$StDev_{RHR\_burner}$ (kW)	0.9070
Duct diameter (m)	0.315	RSP_{av_burner} (m^2/s)	0.0611
		$StDev_{RSP\_burner}$ (m^2/s)	0.0048
Pressure (Pa)	100400		
Humidity (%)	32		
Thermocouples	1,2,3	Lateral spread of flame	no
		Flaming droplets or particles:	
Software version	V5.0w	<= 10 s	no
		> 10s	no

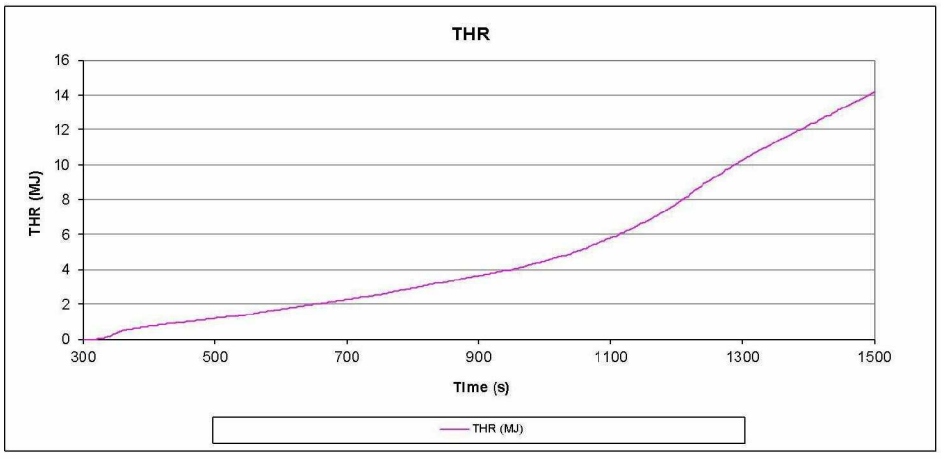
Test reference: P100160-1000-3

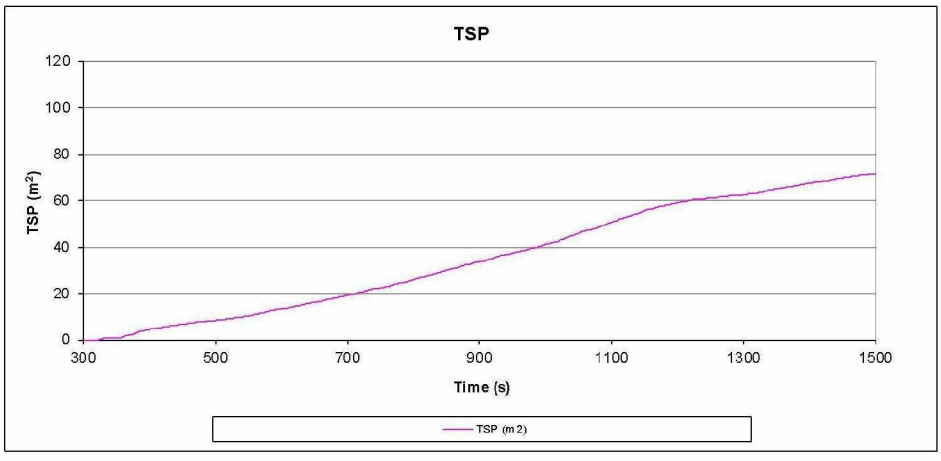
(Run 1) Graph 1 of 2

EN 13823 test

BRE Global

	Product identification	140 mm K15		
	Specimen No.	E7988	$FIGRA_{02}$ (W/s)	318.9
	Test date	28 May 2015	$FIGRA_{04}$ (W/s)	241.1
	Operator	C. A. Rock	THR_{600s} (MJ)	3.6
Laboratory:	Filename	s280515a.rw2	SMOGRA (m^2/s^2)	1.2
BRE Global	Test report number	P100160-1000-3	TSP_{600s} (m^2)	33.6





K_t (-)	0.886	RHR_{av_burner} (kW)	31.8182
K_p (-)	1.08	$StDev_{RHR\_burner}$ (kW)	0.9070
Duct diameter (m)	0.315	RSP_{av_burner} (m^2/s)	0.0611
		$StDev_{RSP\_burner}$ (m^2/s)	0.0048
Pressure (Pa)	100400		
Humidity (%)	32		
Thermocouples	1,2,3	Lateral spread of flame	no
		Flaming droplets or particles:	
Software version	V5.0w	<= 10 s	no
		> 10s	no

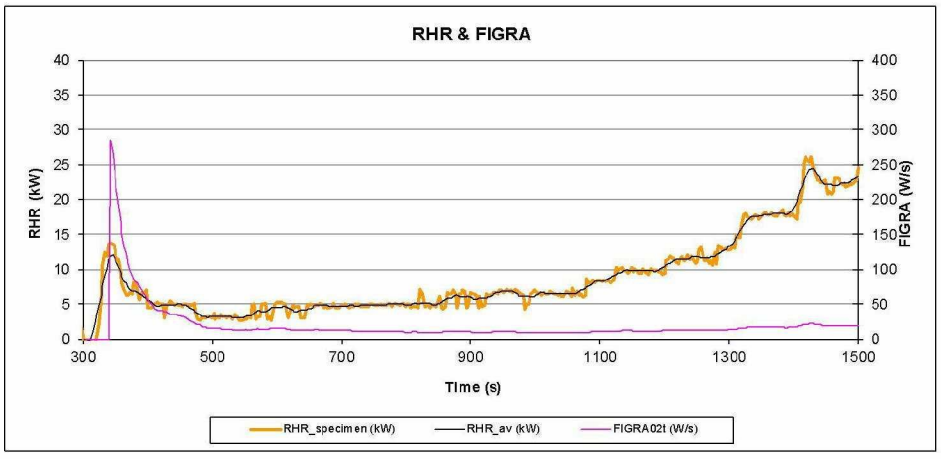
Test reference: P100160-1000-3

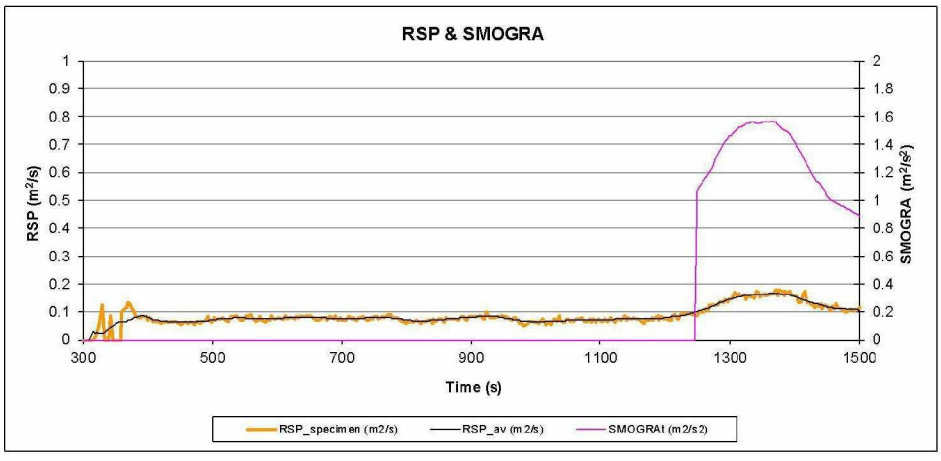
(Run 1) Graph 2 of 2

EN 13823 test

BRE Global

	Product identification	140 mm K15		
	Specimen No.	E7988	$FIGRA_{02}$ (W/s)	285.3
	Test date	28 May 2015	$FIGRA_{04}$ (W/s)	150.0
	Operator	C. A. Rock	THR_{600s} (MJ)	3.0
Laboratory:	Filename	s280515b.rw1	SMOGRA (m^2/s^2)	1.6
BRE Global	Test report number	P100160-1000-3	TSP_{600s} (m^2)	42.8





K_t (-)	0.886	RHR_{av_burner} (kW)	31.1985
K_p (-)	1.08	$StDev_{RHR\_burner}$ (kW)	0.9867
Duct diameter (m)	0.315	RSP_{av_burner} (m^2/s)	0.0656
		$StDev_{RSP\_burner}$ (m^2/s)	0.0087
Pressure (Pa)	100500		
Humidity (%)	30.2		
Thermocouples	1,2,3	Lateral spread of flame	no
		Flaming droplets or particles:	
Software version	V5.0w	<= 10 s	no
		> 10s	no

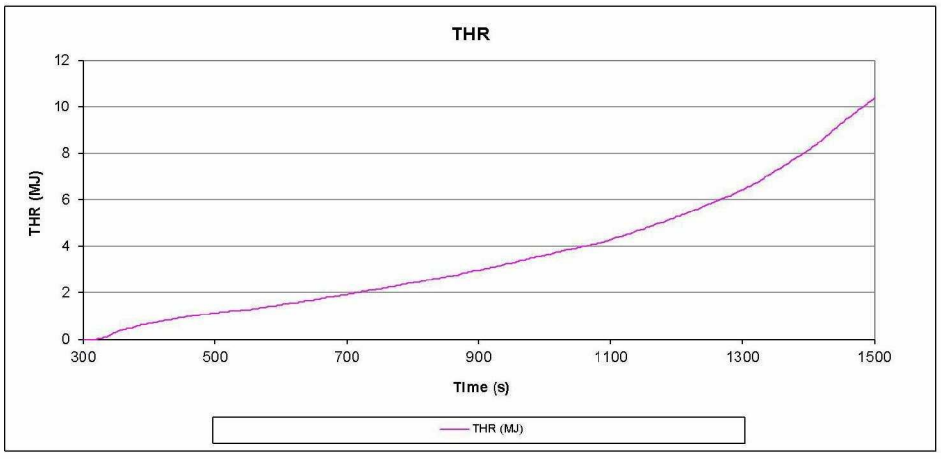
Test reference: P100160-1000-3

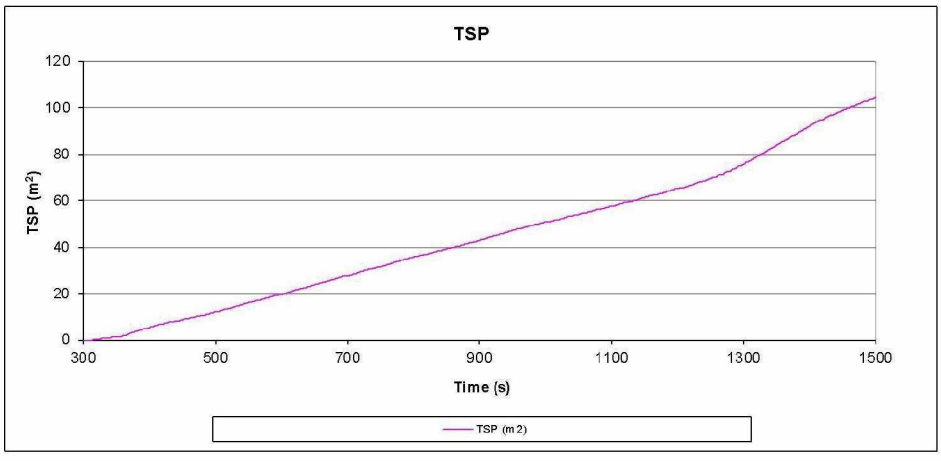
(Run 2) Graph 1 of 2

EN 13823 test

BRE Global

	Product identification	140 mm K15		
	Specimen No.	E7988	$FIGRA_{02}$ (W/s)	285.3
	Test date	28 May 2015	$FIGRA_{04}$ (W/s)	150.0
	Operator	C. A. Rock	THR_{600s} (MJ)	3.0
Laboratory:	Filename	s280515b.rw1	SMOGRA (m^2/s^2)	1.6
BRE Global	Test report number	P100160-1000-3	TSP_{600s} (m^2)	42.8





K_t (-)	0.886	RHR_{av_burner} (kW)	31.1985
K_p (-)	1.08	$StDev_{RHR\_burner}$ (kW)	0.9867
Duct diameter (m)	0.315	RSP_{av_burner} (m^2/s)	0.0656
		$StDev_{RSP\_burner}$ (m^2/s)	0.0087
Pressure (Pa)	100500		
Humidity (%)	30.2		
Thermocouples	1,2,3	Lateral spread of flame	no
		Flaming droplets or particles:	
Software version	V5.0w	<= 10 s	no
		> 10s	no

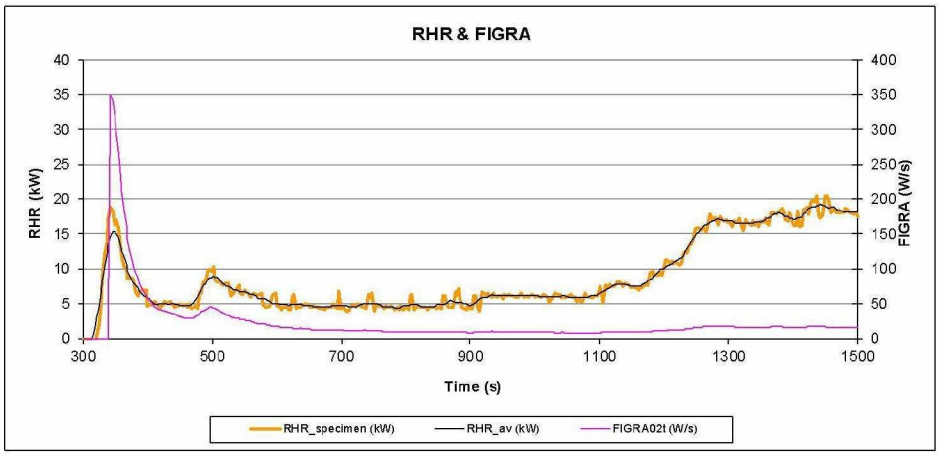
Test reference: P100160-1000-3

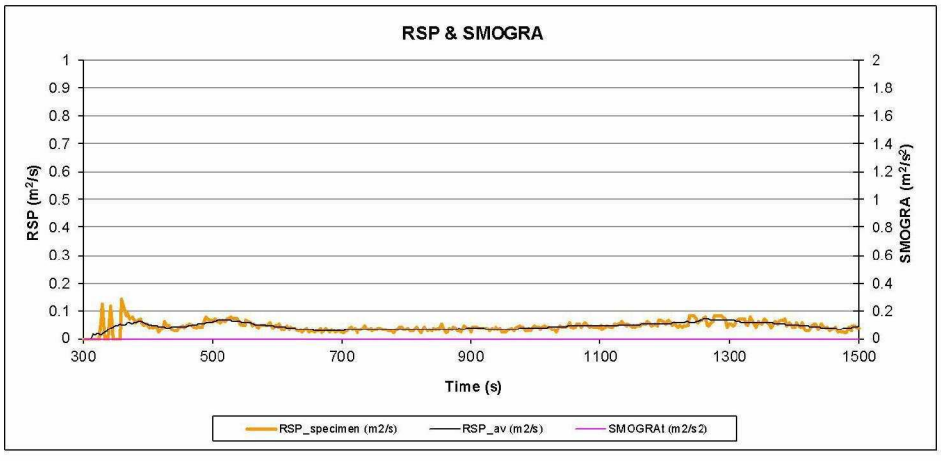
(Run 2) Graph 2 of 2

EN 13823 test

BRE Global

	Product identification	140 mm K15		
	Specimen No.	E7988	$FIGRA_{02}$ (W/s)	350.6
	Test date	29 May 2015	$FIGRA_{04}$ (W/s)	269.0
	Operator	C. A. Rock	THR_{600s} (MJ)	3.5
Laboratory:	Filename	s290515a.rw1	SMOGRA (m^2/s^2)	0.0
BRE Global	Test report number	P100160-1000-3	TSP_{600s} (m^2)	25.3





K_t (-)	0.886	RHR_{av_burner} (kW)	32.1107
K_p (-)	1.08	$StDev_{RHR\_burner}$ (kW)	0.2302
Duct diameter (m)	0.315	RSP_{av_burner} (m^2/s)	0.0611
		$StDev_{RSP\_burner}$ (m^2/s)	0.0048
Pressure (Pa)	99600		
Humidity (%)	46.2		
Thermocouples	1,2,3	Lateral spread of flame	no
		Flaming droplets or particles:	
Software version	V5.0w	<= 10 s	no
		> 10s	no

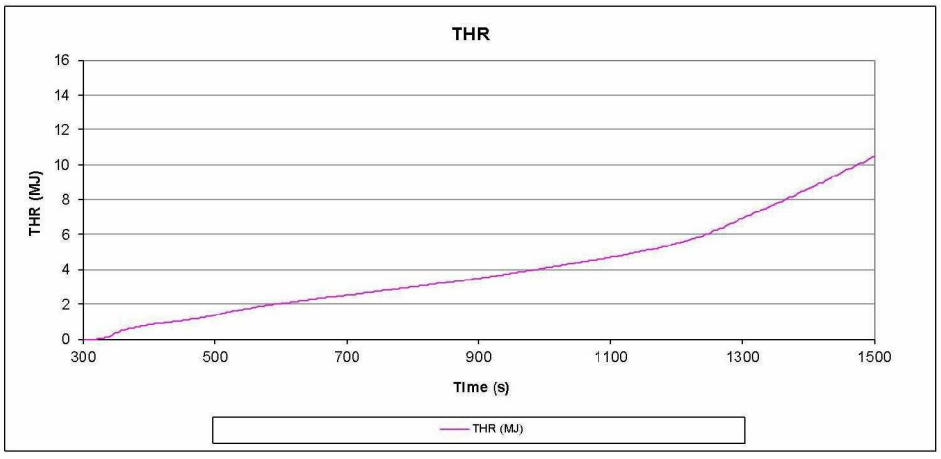
Test reference: P100160-1000-3

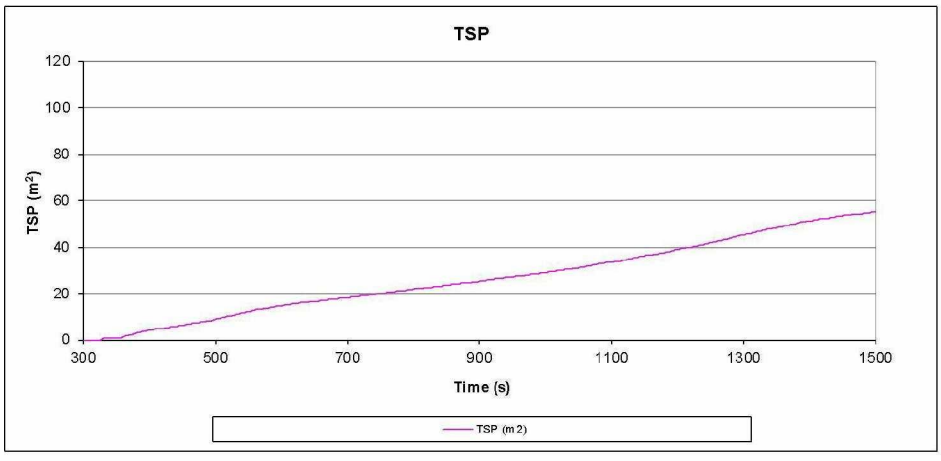
(Run 3) Graph 1 of 2

EN 13823 test

BRE Global

	Product identification	140 mm K15		
	Specimen No.	E7988	$FIGRA_{02}$ (W/s)	350.6
	Test date	29 May 2015	$FIGRA_{04}$ (W/s)	269.0
	Operator	C. A. Rock	THR_{600s} (MJ)	3.5
Laboratory:	Filename	s290515a.rw1	SMOGRA (m^2/s^2)	0.0
BRE Global	Test report number	P100160-1000-3	TSP_{600s} (m^2)	25.3

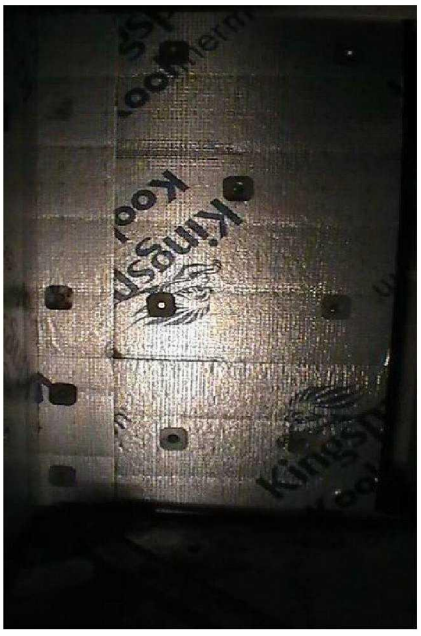




K_t (-)	0.886	RHR_{av_burner} (kW)	32.1107
K_p (-)	1.08	$StDev_{RHR\_burner}$ (kW)	0.2302
Duct diameter (m)	0.315	RSP_{av_burner} (m^2/s)	0.0611
		$StDev_{RSP\_burner}$ (m^2/s)	0.0048
Pressure (Pa)	99600		
Humidity (%)	46.2		
Thermocouples	1,2,3	Lateral spread of flame	no
		Flaming droplets or particles:	
Software version	V5.0w	<= 10 s	no
		> 10s	no

Test reference: P100160-1000-3

(Run 3) Graph 2 of 2



P100160-1000-3 (Run 3) Pre-test photographs

5 Conclusion

EN 13823 does not contain acceptance criteria and therefore this test report does not indicate a pass or fail of the product.

6 Validity

These test results relate to the behaviour of the sample in the form in which it was tested; the results do not necessarily relate to products produced as a result of further processing or refinement of the sample under test.

The test results relate only to behaviour of the test specimens of the product under the particular conditions of test, they are not intended to be the sole criteria for assessing the potential fire hazard of the product in use.

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over 5 years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

7 References

1 EN 13823: 2010 + A1: 2014. Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item. CEN, Avenue Marnix 17, B-1000 Brussels. 2014.

2 EN 13166: 2012. Thermal insulation products for buildings – Factory made phenolic foam (PF) products – Specification. CEN, Avenue Marnix 17, B-1000 Brussels. 2012.

3 EN 13501-1: 2007 + A1: 2009. Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests. CEN, Avenue Marnix 17, B-1000 Brussels. 2009.

Appendix A

Table A.1: Test sponsor's product description

Company: Kingspan Insulation Ltd	
Parameter	**Details (if applicable)**
Trade name	K15
General description	Foil faced Phenolic Insulation board
Name and address of manufacturer of product	Kingspan Insulation Ltd HQ Torvale In est
Place of manufacture	1002 – Kingspan Ireland-Castleblayney Ireland.
Product reference/number	8100143237 1002
Thickness	140 mm
Density	35 kg/m³ specified by Kingspan
Mass per unit area	Note 1
Generic type of product	Closed cell Phenolic
Flame retardant treatment added or organic content limited during production (yes/no), if yes give details	NO
European product standard, if applicable	BS EN 13166
Industry/in-house product standard, if applicable	ThIB
Attestation of conformity systems, if applicable	Note 2
Interior facing 1 (test face) - Generic type - Product reference - Manufacturer - Thickness - Mass per unit area/ density - Colour reference - Trade name flame retardant - Generic type flame retardant - Amount flame retardant	Composite perforated foil face bi-directional scrim with a fibreglass mat Note 1 Note 1 Note 1 Note 1 Silver Foil No flame retardant N/A N/A
Interior facing 2 - Generic type - Product reference - Manufacturer - Thickness - Mass per unit area/ density - Colour reference - Trade name flame retardant - Generic type flame retardant - Amount flame retardant	N/A

Company: Kingspan Insulation Ltd		
Parameter		**Details (if applicable)**
Core material	- Generic type - Product reference - Manufacturer - Thickness - Mass per unit area/density - Colour reference - Trade name flame retardant - Generic type flame retardant - Amount flame retardant	Closed cell Phenolic Kooltherm Kingspan Insulation Ltd 140 mm, total-facing 139.95 mm 35 kg/m³ Pinkish/salmon No flame retardant N/A N/A
Exterior facing 2	- Generic type - Product reference - Manufacturer - Thickness - Mass per unit area/density - Colour reference - Trade name flame retardant - Generic type flame retardant - Amount flame retardant	Same as above (Interior Facing 2)
Exterior facing 1	- Generic type - Product reference - Manufacturer - Thickness - Mass per unit area/density - Colour reference - Trade name flame retardant - Generic type flame retardant - Amount flame retardant	Same as above (Interior facing 1)-product has the same facing on either side.
Adhesive (if applicable)	- Generic type - Product reference - Manufacturer - Application rate - Application method - Specific gravity - Colour reference - Trade name flame retardant - Generic type flame retardant - Amount flame retardant	Note 2
Substrate (if applicable)	- Generic type - Product standard - Product name/reference - Manufacturer - Thickness - Density or mass per unit area - Class (EN 13501-1)	Note 2
Face to be tested		Note 2
Orientation aspects		Note 2

Report Ends

Company: Kingspan Insulation Ltd	
Parameter	**Details (if applicable)**
Sampling Identification Reference	Batch number 8100143237-1002 date of manufacture 02.012.2014
Additional information:	Note 1

Note 1: This commercially sensitive information has been withdrawn from the test report at the request of the test sponsor. The information is held in confidence in the laboratory file.

Note 2: This information was not supplied by the test sponsor.

N/A: Not applicable.