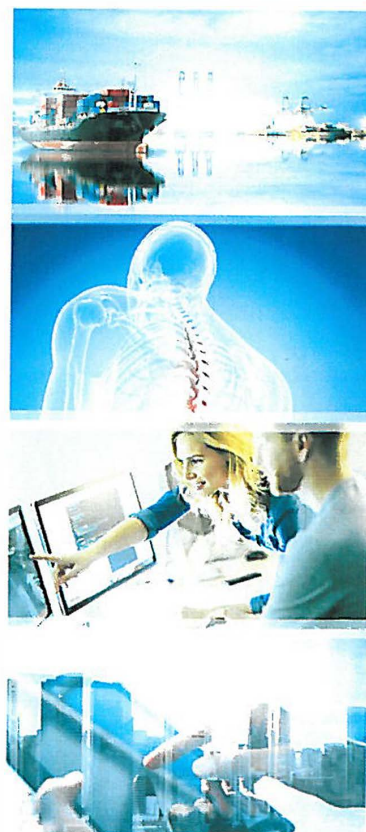
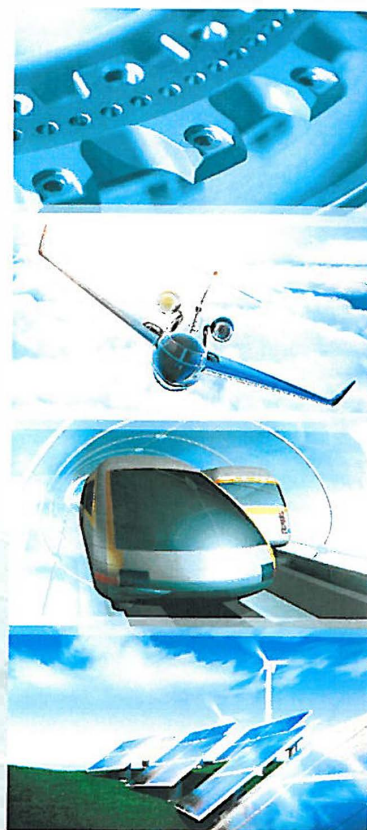




IPAC is a signatory to the FA MIA and ILAC MRA (European Co-operation for Accreditation) and to ILAC (International Laboratory Accreditation Cooperation) for testing.

Laboratório de Fumo e Fogo

RELATÓRIO DE ENSAIO N.º 62/LFF/18





0 Controlo Documental

0.1 Identificação do Documento

Projeto	---
Nome do Documento	Relatório de ensaio n.º 62/LFF/18
Nome do Ficheiro	---

0.2 Controlo de versões

Versão	Edição	Revisão	Data	Descrição	Aprovado por
1	1	0	2018-05-09	Versão original	JMG

0.3 Autor(es)

Nome	Iniciais
Bruno Monteiro – Técnico de Laboratório	BM

0.4 Revisor(es)

Nome	Iniciais
José Mesquita Guimarães – Responsável Técnico do Laboratório	JMG

0.5 Técnico(s) de Laboratório

Nome	Iniciais
Bruno Monteiro – Técnico de Laboratório	BM

0.6 Lista de distribuição

Nome	Iniciais	Entidade
Laboratório de Fumo e Fogo	LFF	INEGI
---	---	FILMOLUX

INEGI – Instituto de Ciência e Inovação em Engenharia Mecânica e Engenharia Industrial
Campus da FEUP | Rua Dr. Roberto Frias, 400 | 4200-465 Porto | PORTUGAL
Tel: +351 22 957 87 10 | Fax: +351 22 953 73 52 | E-mail: inegi@inegi.up.pt | Site: www.inegi.up.pt

0 – Identification

Client: FILMOLUX

Address: 300 rue Etienne Marcel
93170 BAGNOLET

Request: Tests according to standard NP EN 13501-1: 2007+A1: 2013

Request Reference: PE30180486

Compound Reference: FILMOflex PVC FREE BLACK BACK

Reception Date: 2018-04-10

Test Date: 2018-04-26 to 2018-05-08



1 - Scope

The reported tests concern the determination of the fire reaction of a coated knitted fabric, made by FILMOLUX, with reference FILMOflex PVC FREE BLACK BACK.

2 - Methodology

Test	Test procedure
Single flame source test	EN ISO 11925-2:2010
Single Burning Item test	EN 13823:2010 A1 November 2014

The classification method was applied according to the standard NP EN 13051-1:2007+A1 issued of 2013.

3 - Specimens

3.1 – Dimension and conditioning

Prior to testing, the specimens were conditioned for a minimum period of 384 hours at 23 ± 2 °C and 50 ± 5 % relative humidity

The specimens were prepared by the client, having the following dimensions:



Reference	Length (mm)	Width (mm)	Thickness (mm)	Mass (g)
62/LFF/18/03	251	93	0.3	6.3
62/LFF/18/04	252	84	0.3	6.4
62/LFF/18/05	251	91	0.3	6.2
62/LFF/18/06	252	91	0.3	6.4
62/LFF/18/09	251	92	0.3	6.4
62/LFF/18/10	251	91	0.3	6.5
62/LFF/18/11	252	92	0.3	6.5
62/LFF/18/12	251	91	0.3	6.2
62/LFF/18/13	1484	510	0.3	203.2
62/LFF/18/14	1558	1000	0.3	413.7
62/LFF/18/15	1490	405	0.3	203.3
62/LFF/18/18	1520	980	0.3	414.3
62/LFF/18/19	1490	498	0.3	202.8
62/LFF/18/20	1495	1040	0.3	411.9
62/LFF/18/24	251	91	0.3	6.3
62/LFF/18/25	251	92	0.3	6.3
62/LFF/18/26	252	92	0.3	6.3
62/LFF/18/27	251	92	0.3	6.4

3.2 – Mounting of specimen

Specimens were tested free standing (paragraph 5.2.2.a. of EN 13823).

A

4 - Results

4.1 – Single flame source test (EN ISO 11925-2)

Position of flame application	Edge
-------------------------------	------

Specimens	62/LFF/18/ 03	62/LFF/18/ 04	62/LFF/18/ 05	62/LFF/18/ 06	62/LFF/18/ 26	62/LFF/18/ 27
Flame application time(s)	30	30	30	30	30	30
Ignition (s)	1	1	1	1	1	2
F _s (mm)	Not reached	Not reached	Not reached	Not reached	Not reached	Not reached
Droplets/ Particles	No	No	No	No	No	No
Ignition of the filter paper	No	No	No	No	No	No

F_s: Vertical Flame Spread

Position of flame application	Surface
-------------------------------	---------

Specimens	62/LFF/18/ 09	62/LFF/18/ 10	62/LFF/18/ 11	62/LFF/18/ 12	62/LFF/18/ 25	62/LFF/18/ 24
Flame application time (s)	30	30	30	30	30	30
Ignition (s)	2	2	5	5	6	4
F _s (mm)	Not reached	Not reached	Not reached	Not reached	Not reached	Not reached
Droplets/ Particles	No	No	No	No	No	No
Ignition of the filter paper	No	No	No	No	No	No

F_s: Vertical Flame Spread

f

4.2 – Single burning item test (EN 13823)

Specimens	64/LFF/18/13 e 64/LFF/18/18	64/LFF/18/14 e 64/LFF/18/19	64/LFF/18/15 e 64/LFF/18/20	AVERAGE
FIGRA _{0,4 MJ (W/s)}	10.9	TNR	3.3	4.7
THR _{600s (MJ)}	1.1	0.5	0.3	0.6
LFS (m)	No	No	No	No
FIRE BEHAVIOUR	A2/B	A2/B	A2/B	B
SMOGR _{A (m²/s²) (*)}	70.4	56.2	1.2	42.6
TSP _{600s (m²) (*)}	60.2	47.4	17.5	41.7
SMOKE PRODUCTION	s2	s2	s1	s2
FLAMING DROPLETS/PARTICLES	No	No	No	No
FLAMING DROPLETS	d0	d0	d0	d0

FIGRA: Fire growth rate THR: Total heat release LFS: Lateral flame spread (*): With smoke correction
SMOGR_A: Smoke growth rate TSP: Total smoke production TNR: Threshold not reached

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

5 – Conclusion

Considering all the results and according the EN 13501-1 standard, it can be concluded that the material should be included in the following classification:

Fire behaviour		Smoke Production		Flaming droplets
B	-	s	2	, d 0

Porto, May 9, 2018


LFF – Laboratório de Fumo e Fogo
José Mesquita Guimarães
Laboratory Technical Director



ANNEX 1

Photographs of the mounting specimens



Figure 1 – View of mounting.



Figure 2 – The SBI test.



ANNEX 2

SBI Test Reports

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Report produced with the Fire Testing Technology SBI Calc software

page 1

SBI Test Report

Laboratory name LFF
Operator Bruno Montelro
Filename C:\SBI\ALC\DATA\18050005.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

Test	Pre-test conditions	Specimen conditioning
Standard used EN 13823:2010	Baseline duct temperature 297.52 K	Method Constant mass
Date of test 07/05/2018	Ambient temperature 297.10 K	Time interval 331 hours
Date of report 07/05/2018	Ambient pressure 100.501 kPa	Mass 1 203.2 g
E' 17.2 MJ/m ³	Relative humidity 46%	Mass 2 413.7 g
		Temperature 23°C
		RH 50%
Apparatus specifications	Baseline conditions	
kt 0.893	Baseline ambient oxygen 20.653%	
kp 1.08	Baseline oxygen 20.947%	
Duct diameter 0.315 m	Baseline carbon dioxide 0.0852%	
O2 calibration delay time 22 s	Baseline smoke 99.90%	
CO2 calibration delay time 17 s		

Specimen Information

Thickness 0.3 mm	Mounting method 5.2.2a) in EN 13823:2002
Density	Joints none
Surface mass/area	Fixed to substrate? No
Specimen number 1	Fixing method N/A
Date of arrival 23/04/2018	Substrate none
	Manufacturer FILMOLUX
	Sponsor

Test validity criteria

Test drifts

	Initial	Final	Change
Oxygen	20.947%	20.911%	0.035%
CO2	0.085%	0.091%	0.006%
Smoke	99.90%	99.33%	0.006

Exposure time 1254 s

Synchronisation details

Duct temp. dropped by 2.5 K from baseline of 323.25 K at 303 s
Oxygen rose by 0.05% from baseline of 20.635% at 291 s
CO2 dropped by 0.02% from baseline of 0.344% at 297 s

Burner details

Auxiliary Burner HRR	29.552 kW
Auxiliary Burner HRR std. dev.	0.749 kW
Burner CO2/O2 ratio	0.832
Auxiliary Burner SPR	0.023 m ² /s
Auxiliary Burner SPR std. dev.	0.003 m ² /s
Burner response time (s)	12 s

Other checks

Minimum duct flow	0.518 m ³ /s
Maximum duct flow	0.610 m ³ /s
No T/C failure	

Classification results

FIGRA(0.2)	10.9 W/s at 687 s
FIGRA(0.4)	10.9 W/s at 687 s
THR(600)	1.1 MJ
SMOGRA	70.4 cm ² /s ² at 327 s
TSP(600)	60.2 m ²

Classification observations

LFS to edge?	No
FDP flaming <= 10s?	No
FDP flaming > 10s?	No

Potential classification

Class	A2/B
Smoke production	s2
Flaming droplets/particles	d0

Recorded events

Surface flashes? No; Falling specimen parts? No; Smoke not entering hood? No
Mutual fixing of backing board failed? No; Distortion/collapse of specimen? No

Pre-test comments

After-test comments

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



Report produced with the Fire Testing Technology SBI Calc software

page 2

SBI Test Report

Laboratory name	LFF
Operator	Bruno Montelero
Filename	C:\SBICALC\DATA\18050005.RW1
Report identification	62/LFF/18
Product identification	FILMOflex PVC FREE BLACK BACK

Alternative smoke results

Smoke test filename	C:\SBICALC\SMOKE\18050701.RW1
Main burner SPR	0.054 m ² /s
Main burner SPR std. dev.	0.006 m ² /s

Alternative classification results

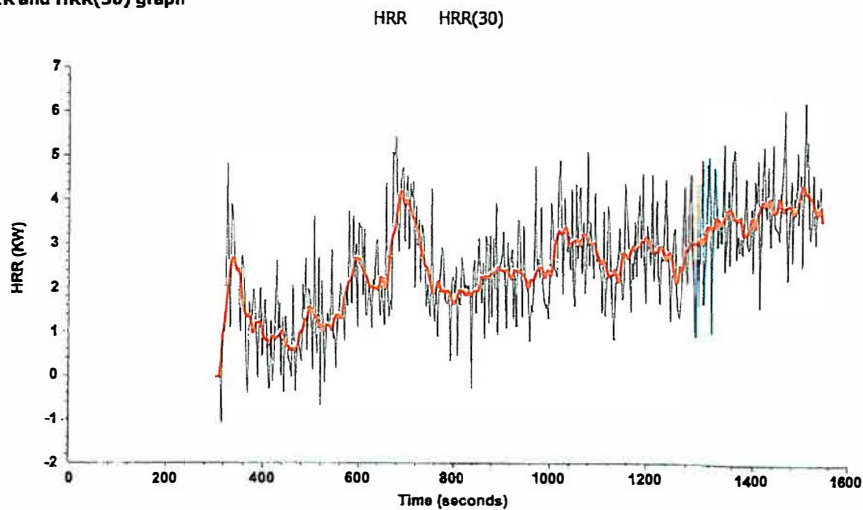
SMOGRA	54.0 cm ² /s ² at 327 s
TSP(600)	41.7 m ²
Smoke production class	s2

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

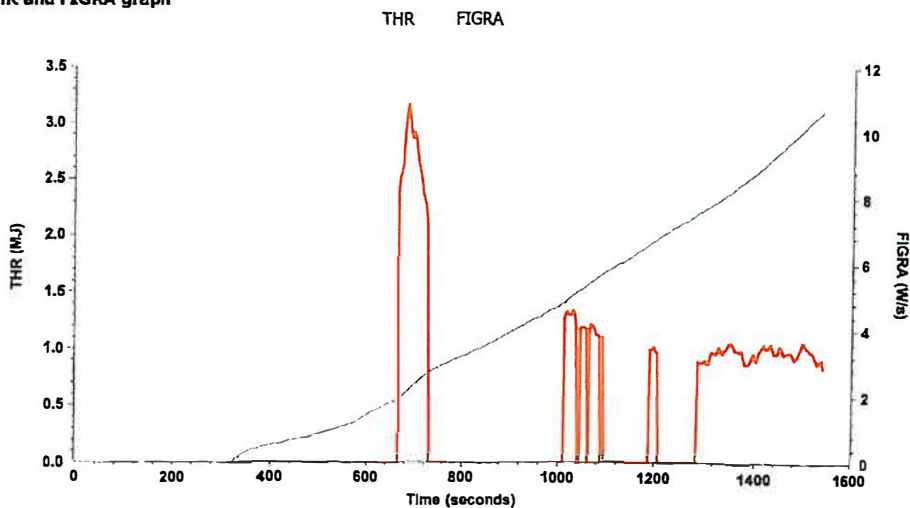
SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050005.RW1 62/LFF/18
Report identification FILMOflex PVC FREE BLACK BACK
Product identification

HRR and HRR(30) graph



THR and FIGRA graph



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



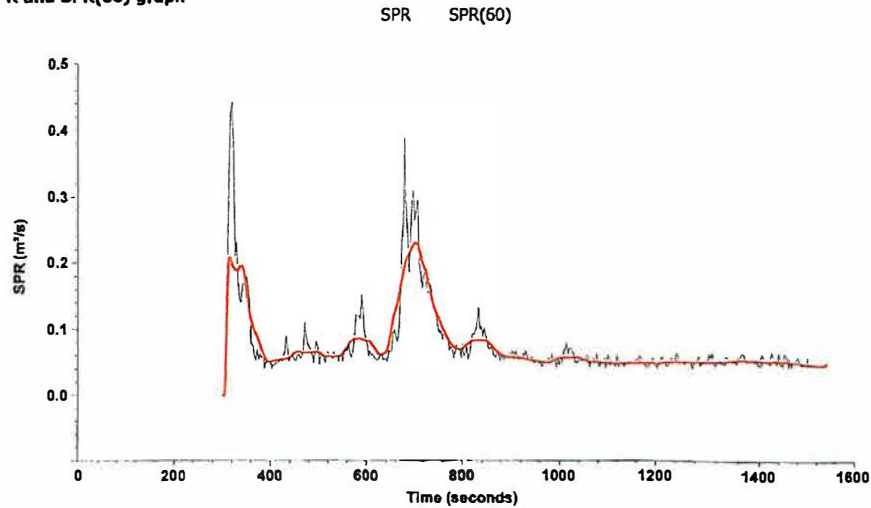
Report produced with the Fire Testing Technology SBICalc software

page 4

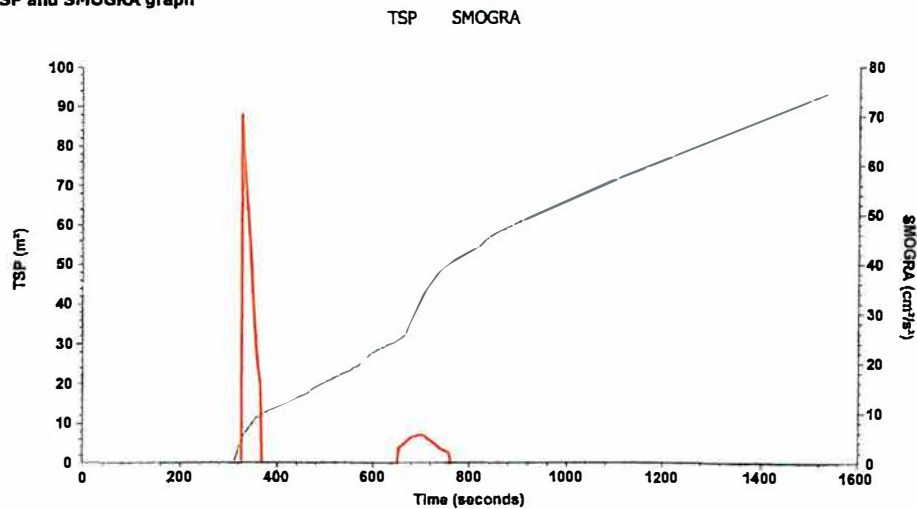
SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050005.RW1 62/LFF/18
Report identification FILMOflex PVC FREE BLACK BACK
Product Identification

SPR and SPR(60) graph



TSP and SMOGRA graph



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

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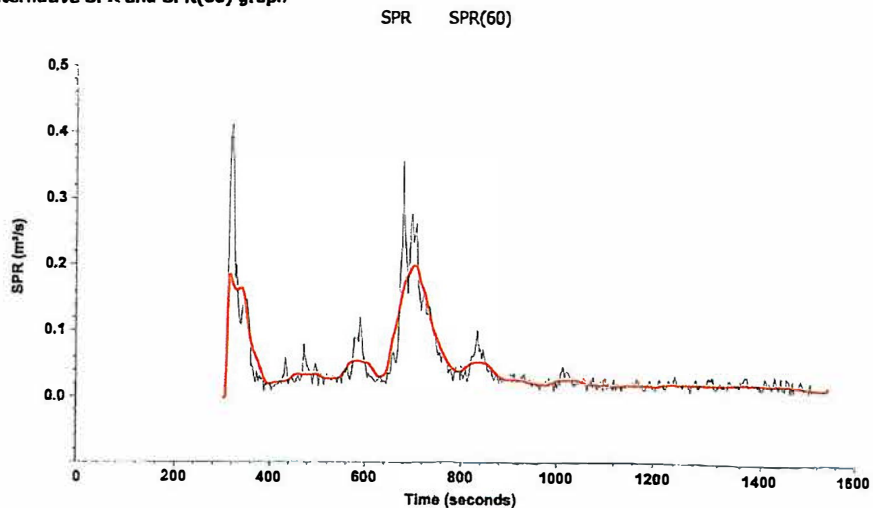
Report produced with the Fire Testing Technology SBICalc software

page 5

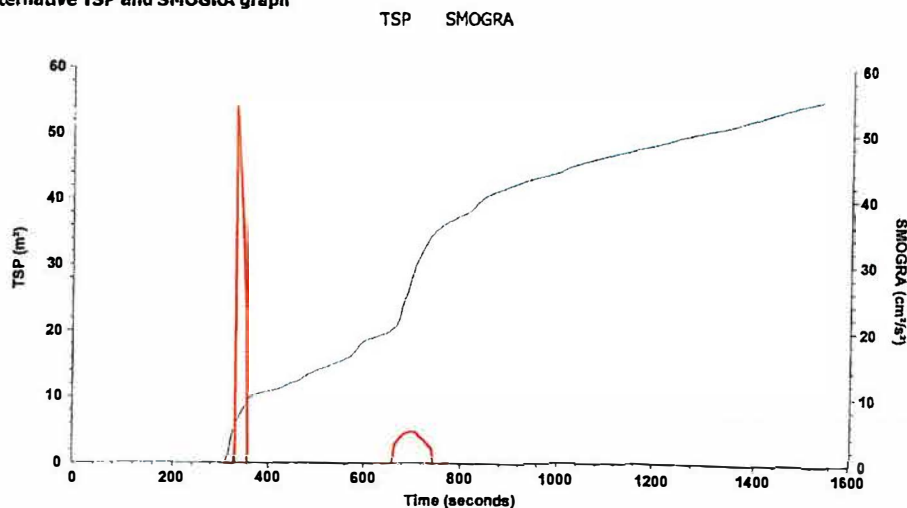
SBI Test Report

Laboratory name LFF
Operator Bruno Montelro
Filename C:\SBICALC\DATA\18050005.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

Alternative SPR and SPR(60) graph



Alternative TSP and SMOGRA graph



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

Report produced with the Fire Testing Technology SBICalc software

page 1

SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050007.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

Test	Pre-test conditions	Specimen conditioning
Standard used EN 13823:2010	Baseline duct temperature 295.94 K	Method Constant mass
Date of test 07/05/2018	Ambient temperature 295.47 K	Time interval 336 hours
Date of report 07/05/2018	Ambient pressure 100.383 kPa	Mass 1 203.3 g
E' 17.2 MJ/m ³	Relative humidity 51%	Mass 2 414.3 g
		Temperature 23°C
		RH 50%

Apparatus specifications

kt 0.893
kp 1.08
Duct diameter 0.315 m
O2 calibration delay time 22 s
CO2 calibration delay time 17 s

Baseline conditions

Baseline ambient oxygen 20.653%
Baseline oxygen 20.949%
Baseline carbon dioxide 0.0796%
Baseline smoke 99.96%

Specimen information

Thickness 0.3 mm
Density
Surface mass/area
Specimen number 2
Date of arrival 24/04/2018

Mounting method 5.2.2a) in EN 13823:2002
Joints none
Fixed to substrate? No
Fixing method N/A
Substrate none
Manufacturer FILMOLUX
Sponsor

Test validity criteria

Test drifts

	Initial	Final	Change
Oxygen	20.949%	20.945%	0.004%
CO2	0.080%	0.086%	0.006%
Smoke	99.96%	99.62%	0.003

Exposure time 1254 s

Synchronisation details

Duct temp. dropped by 2.5 K from baseline of 321.72 K at 303 s
Oxygen rose by 0.05% from baseline of 20.645% at 294 s
CO2 dropped by 0.02% from baseline of 0.328% at 297 s

Burner details

Auxiliary Burner HRR 29.339 kW
Auxiliary Burner HRR std. dev. 0.592 kW
Burner CO2/O2 ratio 0.816
Auxiliary Burner SPR 0.027 m³/s
Auxiliary Burner SPR std. dev. 0.004 m³/s
Burner response time (s) 15 s

Other checks

Minimum duct flow 0.519 m³/s
Maximum duct flow 0.601 m³/s
No T/C failure

Classification results

FIGRA(0.2) threshold not reached
FIGRA(0.4) threshold not reached
THR(600) 0.5 MJ
SMOGRA 56.2 cm²/s² at 339 s
TSP(600) 47.4 m²

Classification observations

LFS to edge? No
FDP flaming <= 10s? No
FDP flaming > 10s? No

Potential classification

Class A2/B
Smoke production s2
Flaming droplets/particles d0

Recorded events Surface flashes? No; Falling specimen parts? No; Smoke not entering hood? No
Mutual fixing of backing board failed? No; Distortion/collapse of specimen? No

Pre-test comments

After-test comments

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

Report produced with the Fire Testing Technology SBICalc software

page 2

SBI Test Report

Laboratory name	LFF
Operator	Bruno Monteiro
Filename	C:\SBICALC\DATA\18050007.RW1
Report identification	62/LFF/18
Product identification	FILMOflex PVC FREE BLACK BACK

Alternative smoke results

Smoke test filename	C:\SBICALC\SMOKE\18050701.RW1
Main burner SPR	0.054 m ² /s
Main burner SPR std. dev.	0.006 m ² /s

Alternative classification results

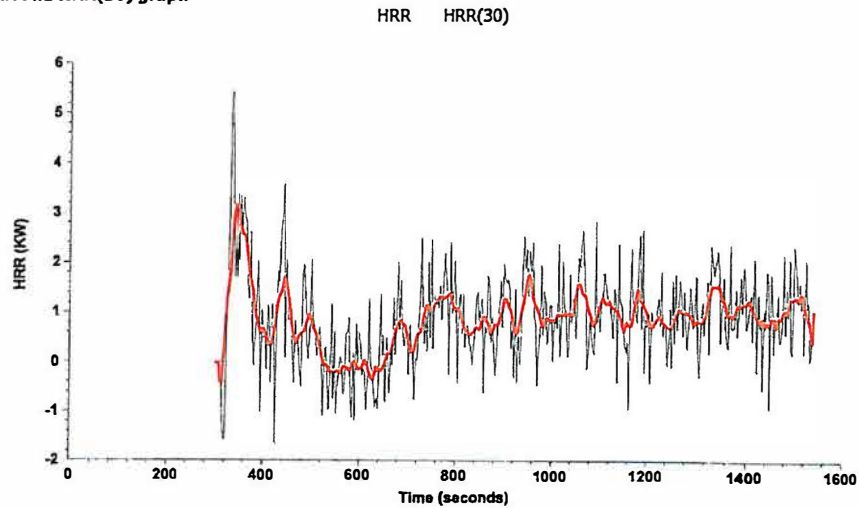
SMOGRA	47.5 cm ² /s ² at 339 s
TSP(600)	31.3 m ²
Smoke production class	s2

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

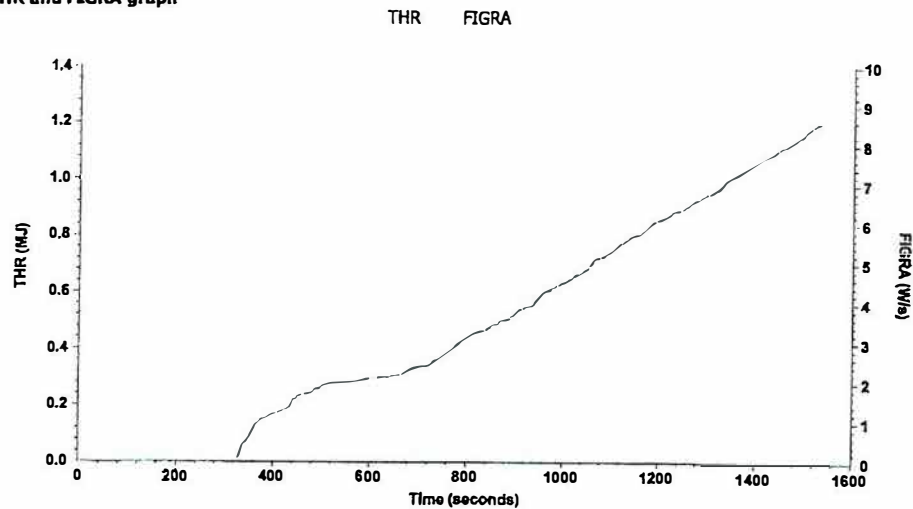
SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050007.RW1
Report Identification 62/LFF/18
Product Identification FILMOflex PVC FREE BLACK BACK

HRR and HRR(30) graph



THR and FIGRA graph



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

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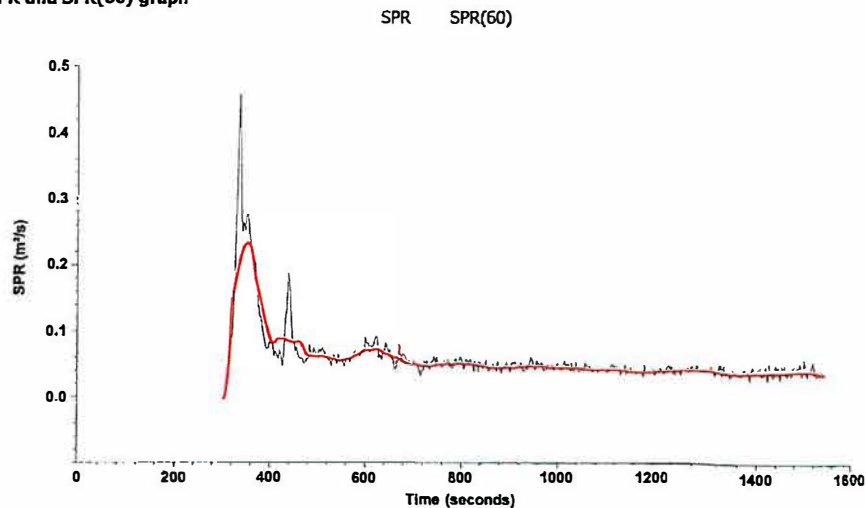
Report produced with the Fire Testing Technology SBICalc software

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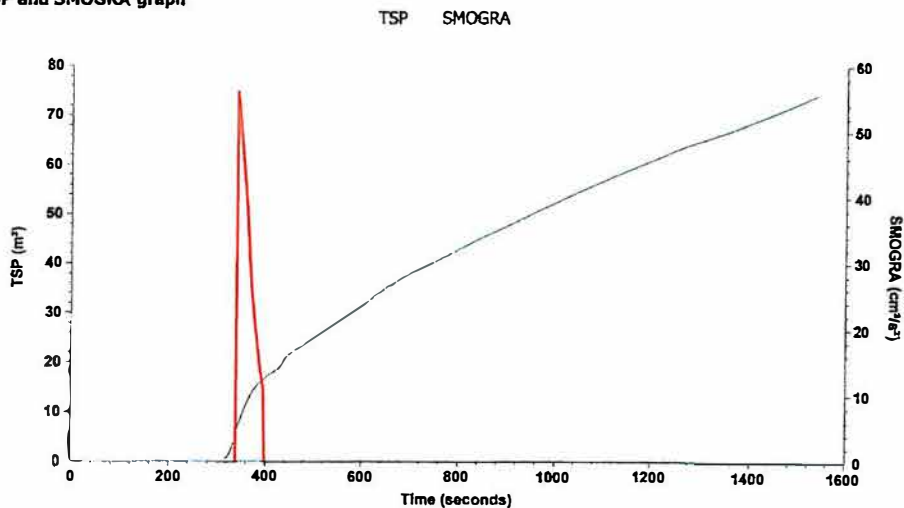
SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050007.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

SPR and SPR(60) graph



TSP and SMOGRA graph



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

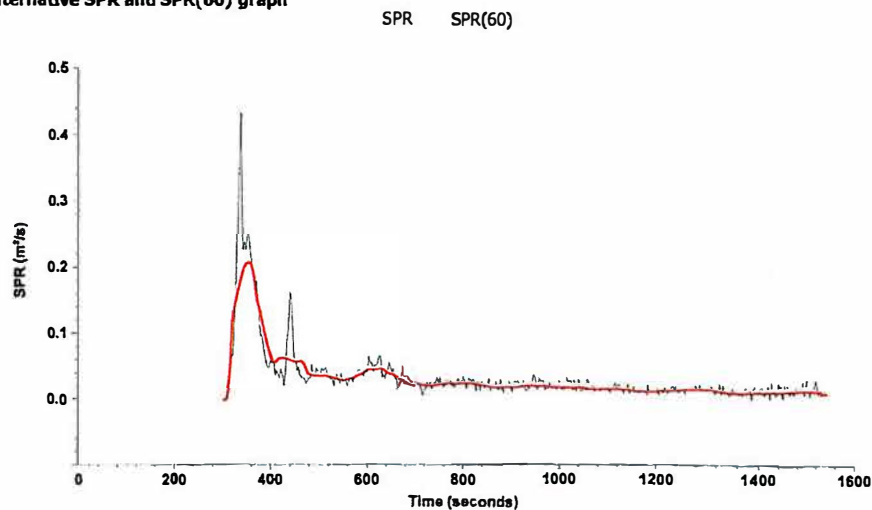
Report produced with the Fire Testing Technology SBICalc software

page 5

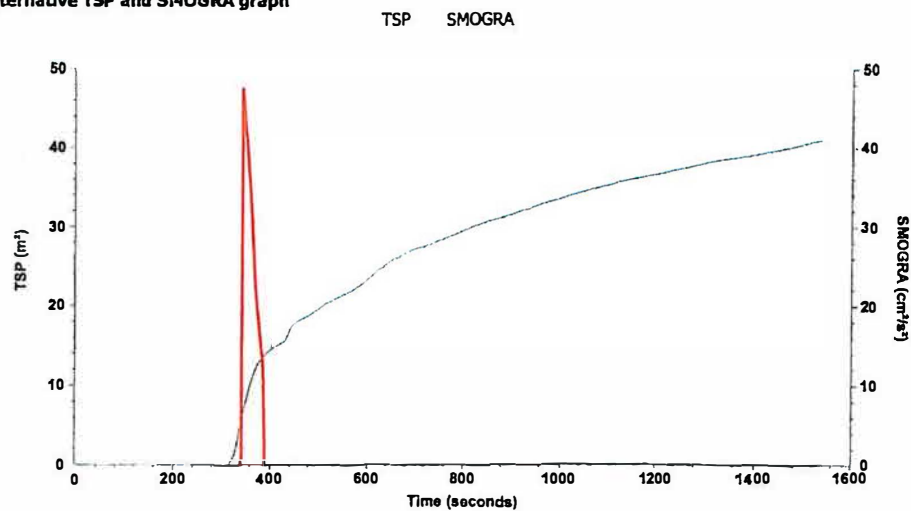
SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050007.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

Alternative SPR and SPR(60) graph



Alternative TSP and SMOGRA graph



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

SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBIC\DATA\18050010.RW1
Report identification 62/LFF/18
Product identification FILMOFex PVC FREE BLACK BACK

Test	Pre-test conditions	Specimen conditioning
Standard used EN 13823:2010	Baseline duct temperature 297.69 K	Method Constant mass
Date of test 08/05/2018	Ambient temperature 295.92 K	Time interval 356 hours
Date of report 08/05/2018	Ambient pressure 100.523 kPa	Mass 1 202.8 g
E' 17.2 MJ/m ³	Relative humidity 49%	Mass 2 411.9 g
		Temperature 23°C
		RH 50%

Apparatus specifications

kt 0.893
kp 1.08
Duct diameter 0.315 m
O2 calibration delay time 22 s
CO2 calibration delay time 17 s

Baseline conditions

Baseline ambient oxygen 20.632%
Baseline oxygen 20.948%
Baseline carbon dioxide 0.0863%
Baseline smoke 100.04%

Specimen information

Thickness 0.3 mm
Density
Surface mass/area
Specimen number 3
Date of arrival 24/04/2018

Mounting method 5.2.2a) in EN 13823:2002
Joints none
Fixed to substrate? No
Fixing method N/A
Substrate none
Manufacturer FILMOLUX
Sponsor

Test validity criteria

Test drifts

	Initial	Final	Change
Oxygen	20.948%	20.930%	0.018%
CO2	0.086%	0.091%	0.005%
Smoke	100.04%	99.57%	0.005

Exposure time 1254 s

Synchronisation details

Duct temp. dropped by 2.5 K from baseline of 323.07 K at 303 s
Oxygen rose by 0.05% from baseline of 20.622% at 291 s
CO2 dropped by 0.02% from baseline of 0.342% at 297 s

Burner details

Auxiliary Burner HRR 31.372 kW
Auxiliary Burner HRR std. dev. 0.746 kW
Burner CO2/O2 ratio 0.784
Auxiliary Burner SPR 0.024 m²/s
Auxiliary Burner SPR std. dev. 0.003 m²/s
Burner response time (s) 15 s

Other checks

Minimum duct flow 0.508 m³/s
Maximum duct flow 0.594 m³/s
No T/C failure

Classification results

FIGRA(0.2) 3.3 W/s at 1410 s
FIGRA(0.4) 3.3 W/s at 1410 s
THR(600) 0.3 MJ
SMOGRA 1.2 cm²/s² at 1413 s
TSP(600) 17.5 m²

Classification observations

LFS to edge? No
FDP flaming <= 10s? No
FDP flaming > 10s? No

Potential classification

Class A2/B
Smoke production s1
Flaming droplets/particles d0

Recorded events

Surface flashes? No; Falling specimen parts? No; Smoke not entering hood? No
Mutual fixing of backing board failed? No; Distortion/collapse of specimen? No

Pre-test comments

After-test comments

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

Report produced with the Fire Testing Technology SBI Calc software

page 2

SBI Test Report

Laboratory name LFF
Operator Bruno Montelro
Filename C:\SBICALC\DATA\18050010.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

Alternative smoke results

Smoke test filename C:\SBICALC\SMOKE\18050801.RW1
Main burner SPR 0.059 m²/s
Main burner SPR std. dev. 0.005 m²/s

Alternative classification results

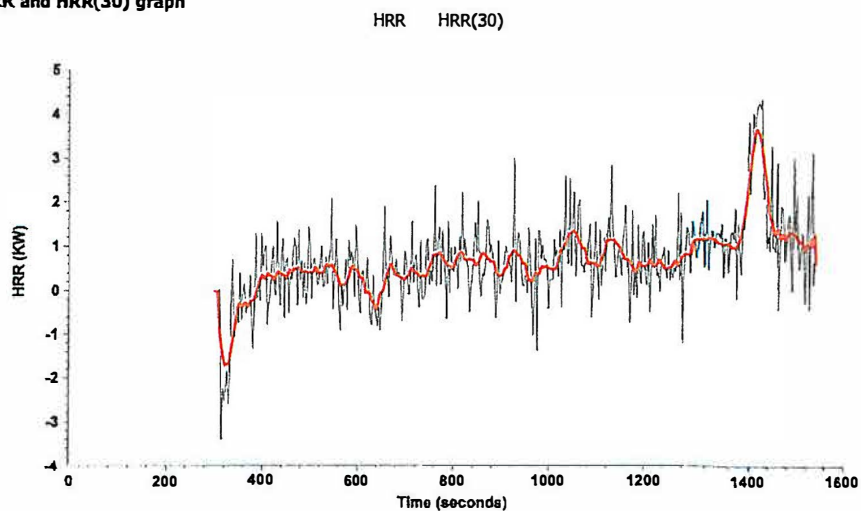
SMOGRA 0.9 cm²/s² at 1413 s
TSP(600) 1.7 m²
Smoke production class s1

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

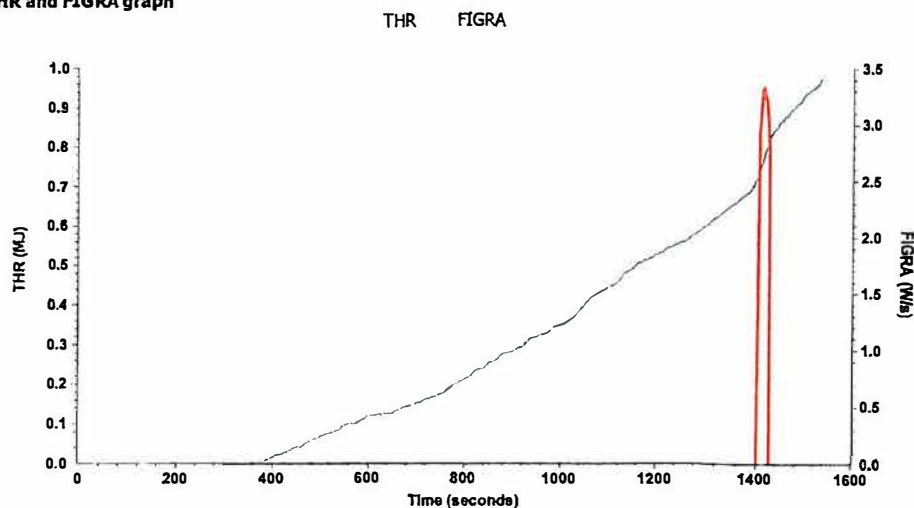
SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050010.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

HRR and HRR(30) graph



THR and FIGRA graph



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

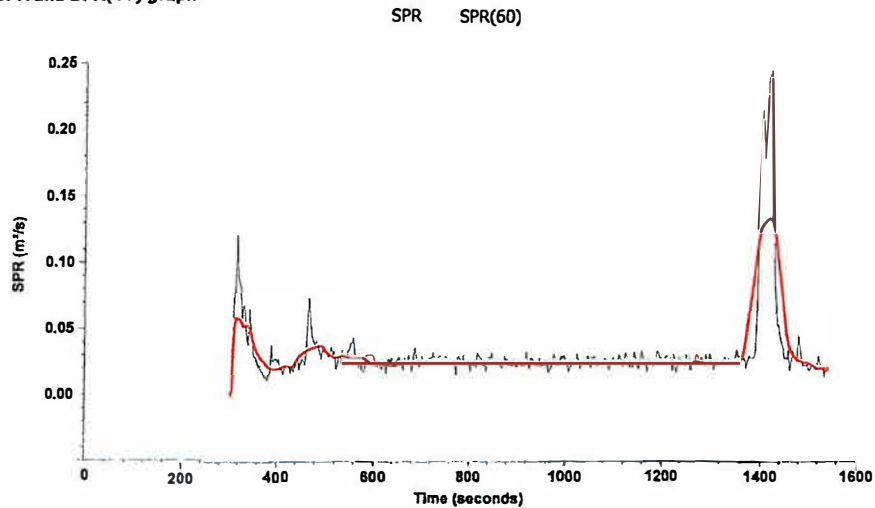
Report produced with the Fire Testing Technology SBICalc software

page 4

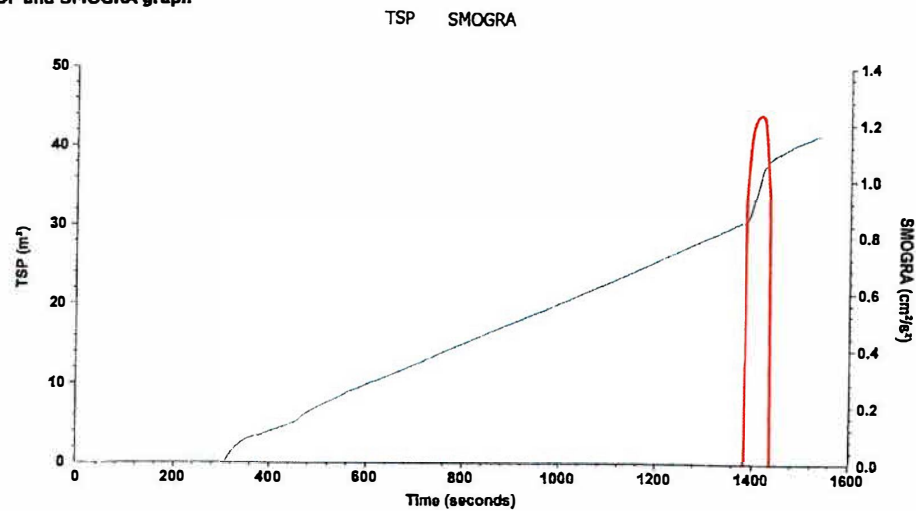
SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050010.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

SPR and SPR(60) graph



TSP and SMOGRA graph



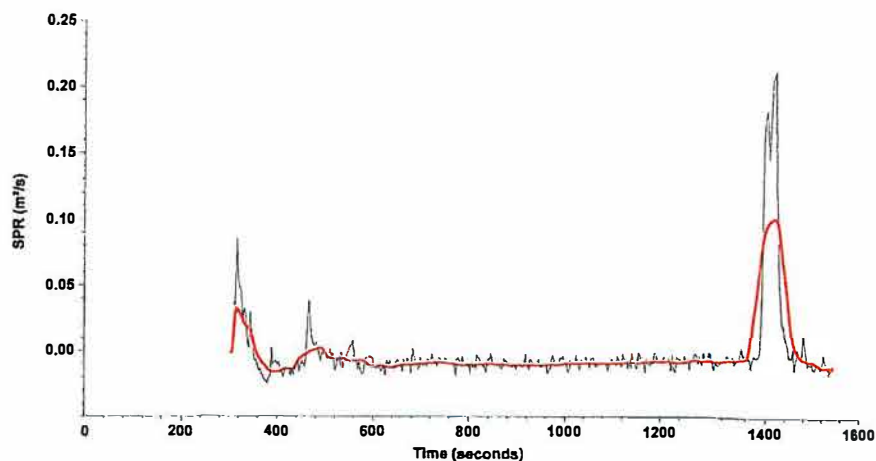
The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

SBI Test Report

Laboratory name LFF
Operator Bruno Monteiro
Filename C:\SBICALC\DATA\18050010.RW1
Report identification 62/LFF/18
Product identification FILMOflex PVC FREE BLACK BACK

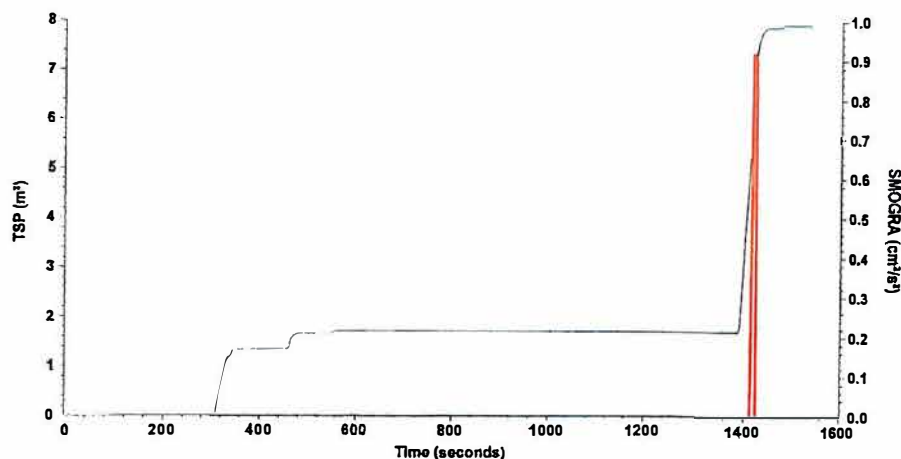
Alternative SPR and SPR(60) graph

SPR SPR(60)



Alternative TSP and SMOGRA graph

TSP SMOGRA



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



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