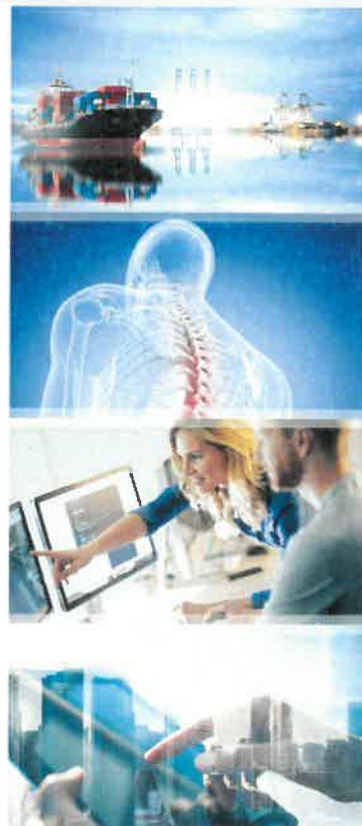


Laboratório de Fumo e Fogo



ENSAIOS DE REAÇÃO AO FOGO

SONAE – INDÚSTRIA DE REVESTIMENTOS, S.A.

RELATÓRIO DE ENSAIO N.º LFF.2019.074.02

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0 Controlo Documental e Identificação

0.1 Identificação do Documento

Projeto	---
Nome do Documento	Relatório de ensaio n.º LFF.2019.074.02
Nome do Ficheiro	---

0.2 Controlo de versões

Versão	Edição	Revisão	Data	Descrição	Aprovado por
1	1	0	2019-04-12	Versão original	JMG

0.3 Autor(es)

Nome	Iniciais
Anabela Martins – Técnico de laboratório	AM

0.4 Revisor(es)

Nome	Iniciais
José Mesquita Guimarães – Responsável Técnico do Laboratório	JMG

0.5 Técnico(s) de Laboratório

Nome	Iniciais
Bruno Nogueira – Técnico de laboratório	BN

0.6 Lista de distribuição

Nome	Iniciais	Entidade
Laboratório de Fumo e Fogo	LFF	INEGI
---	---	Sonae – Indústria de Revestimentos, S.A.

0.7 Identificação

Cliente: Sonae – Indústria de Revestimentos, S.A.

Endereço: Lugar do Espido – Via Norte
4470-177 Maia

Pedido: Testes de acordo com a norma EN 13823:2010 A1 de novembro 2014

Referência do pedido: PE30190306

Data do pedido: 2019-03-22

Referência do material: Surforma CPL (0.4 - 0.8 mm)

Data de receção do material: 2019-03-28

Data de realização dos ensaios: 2019-04-05 e 2019-04-08

Data do relatório: 2019-04-12



1 - Introdução

O presente relatório refere-se a ensaios exploratórios de reação ao fogo e potencial classificação de materiais com a referência " Surforma CPL (0.4 - 0.8 mm)".

2 - Metodologia

Ensaio	Método
Diversos parâmetros de flamabilidade (SBI)	EN 13823:2010 A1 de novembro 2014

3 - Provetes

3.1 – Dimensões e condicionamento

Os provetes foram preparados pelo cliente e apresentavam as seguintes dimensões:

Referência	Comprimento (mm)	Largura (mm)	Espessura (mm)	Massa (g)
LFF.2019.074.01 (N1)	1500	1001	0.5	1210
LFF.2019.074.02 (N1)	1500	500	0.5	420
LFF.2019.075.01 (N2)	1502	1001	0.6	1360
LFF.2019.075.02 (N2)	1501	502	0.6	450
LFF.2019.076.01 (N3)	1500	1000	0.7	1310
LFF.2019.076.02 (N3)	1500	501	0.7	620

Antes de serem ensaiados foram condicionados durante 190 horas à temperatura de 23 ± 2 °C e à humidade relativa de 50 ± 5 %, tendo-se verificado o cumprimento do critério de obtenção de massa constante.

3.2 – Montagem dos provetes

Os provetes foram ensaiados em posição livre (alínea 5.2.2.a da norma EN 13823).

4 – Resultados

Provete	LFF.2019.074.01 e LFF.2019.074.02	LFF.2019.075.01 e LFF.2019.075.02	LFF.2019.076.01 e LFF.2019.076.02
FIGRA _{0,2MJ} (W/s)	694.3	396.1	415.8
FIGRA _{0,4MJ} (W/s)	643.3	350.4	231.8
THR _{600s} (MJ)	2.7	2.6	2.1
LFS (m)	Não	Não	Não
CLASSIFICAÇÃO DE REAÇÃO AO FOGO	D	D	C
SMOGR _A (m ² /s ²) (*)	67.2	81.4	41.4
TSP _{600s} (m ²) (*)	33.6	35.7	28.8
CLASSIFICAÇÃO DE FUMOS	s2	s2	s2
QUEDA DE GOTAS / PARTÍCULAS	Não	Sim	Não
CLASSIFICAÇÃO QUEDA DE GOTAS	d0	d1	d0

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

Os resultados do teste referem-se ao comportamento dos provetes de teste de um produto sob as condições particulares do teste; não pretendem ser o único critério para avaliar o perigo potencial de incêndio do produto em uso.

5 – Limitações

Este documento não representa nenhum tipo de aprovação ou certificação do produto.

Este documento é válido por 5 (cinco) anos.

Porto, 12 de abril de 2019



José Mesquita Guimarães
Responsável Técnico do Laboratório

ANEXO 1

Fotos



Figura 1 – Montagem dos provetes (N1).



Figura 2 – Teste no SBI (N1).



Figura 3 – Montagem dos provetes (N2).



Figura 4 – Teste no SBI (N2).



Figura 5 – Montagem dos provetes (N3).



Figura 6 – Teste no SBI (N3).

ANEXO 2

Relatório do SBI

Report produced with the Fire Testing Technology SBICalc software

page 1

SBI Test Report

Laboratory name INEGI - LFF
Operator Bruno Nogueira
Filename C:\SBICALC\DATA\19040006.RW1
Report Identification LFF.2019.074
Product identification SURFORMA-N1

Test	Pre-test conditions	Specimen conditioning
Standard used EN 13823:2010	Baseline duct temperature 294.93 K	Method Constant mass
Date of test 05/04/2019	Ambient temperature 294.98 K	Time interval 193 hours
Date of report 05/04/2019	Ambient pressure 99.012 kPa	Mass 1 2420 g
E' 17.2 MJ/m ³	Relative humidity 49%	Mass 2 840 g
		Temperature 23°C
		RH 49%
Apparatus specifications	Baseline conditions	
kt 0.823	Baseline ambient oxygen 20.677%	
kp 1.08	Baseline oxygen 20.949%	
Duct diameter 0.315 m	Baseline carbon dioxide 0.0880%	
O2 calibration delay time 11 s	Baseline smoke 100.06%	
CO2 calibration delay time 13 s		

Specimen information			
Thickness 0.8 mm	Mounting method 5.2.2a) in EN 13823:2002		
Density 1448 kg/m ³	Joints none		
Surface mass/area	Flood to substrate? No		
Specimen number 1	Fixing method N/A		
Date of arrival 29/03/2019	Substrate none		
	Manufacturer SONAE INDÚSTRIA REVESTIMENTOS SA		
	Sponsor SONAE INDÚSTRIA REVESTIMENTOS SA		

Test validity criteria				Burner details	
Test drifts				Burner HRR	27.997 kW
	Initial	Final	Change	Burner HRR std. dev.	0.558 kW
Oxygen	20.949%	20.890%	0.059%	Burner CO2/O2 ratio	0.812
CO2	0.088%	0.098%	0.010%	Burner SPR	0.024 m ³ /s
Smoke	100.06%	99.26%	0.008	Burner SPR std. dev.	0.005 m ³ /s
Exposure time	1254 s			Burner response time	9 s
Synchronisation details				Other checks	
Duct temp. dropped by 2.5 K from baseline of 320.14 K at 303 s				Minimum duct flow	0.471 m ³ /s
Oxygen rose by 0.05% from baseline of 20.637% at 300 s				Maximum duct flow	0.548 m ³ /s
CO2 dropped by 0.02% from baseline of 0.341% at 300 s				No T/C failure	

Classification results	Classification observations	Potential classification
FIGRA(0.2) 694.3 W/s at 336 s	LFS to edge? No	Class D
FIGRA(0.4) 643.4 W/s at 339 s	FDP flaming <= 10s? No	Smoke production s2
THR(600) 2.7 MJ	FDP flaming > 10s? No	Flaming droplets/particles 00
SMOGRA 67.2 m ³ /s ² at 339 s		
TSP(600) 33.6 m ³		

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

Pre-test comments

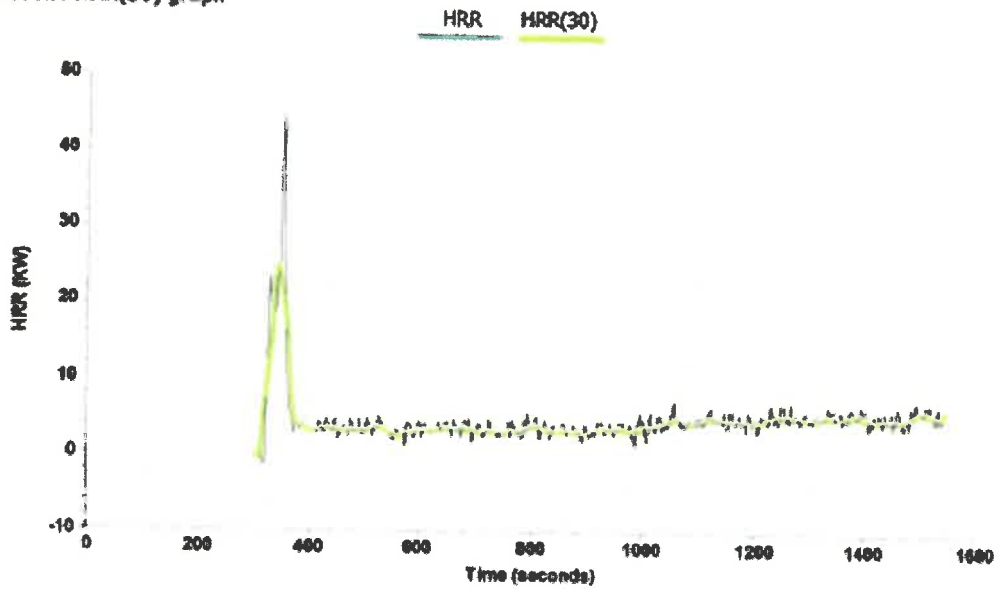
After-test comments Aos 350 s, destruição quase total do provete no canto até cerca de 1 m de altura.

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.

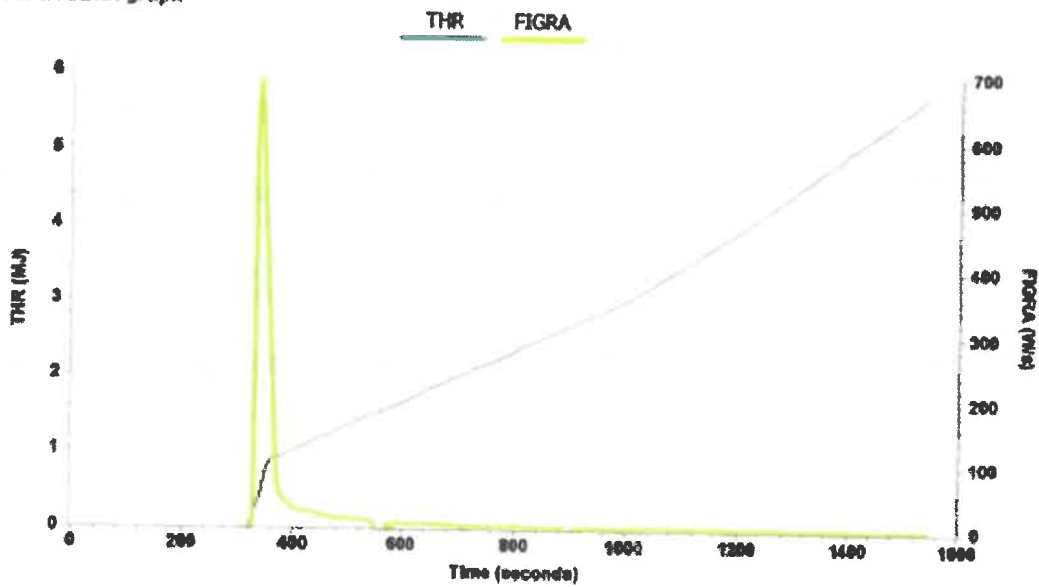
SBI Test Report

Laboratory name INEGI - LFF
Operator Bruno Nogueira
Filename C:\SBI\CALC\DATA\19040006.RW1
Report identification LFF.2019.074
Product identification SURFORMA-N1

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.

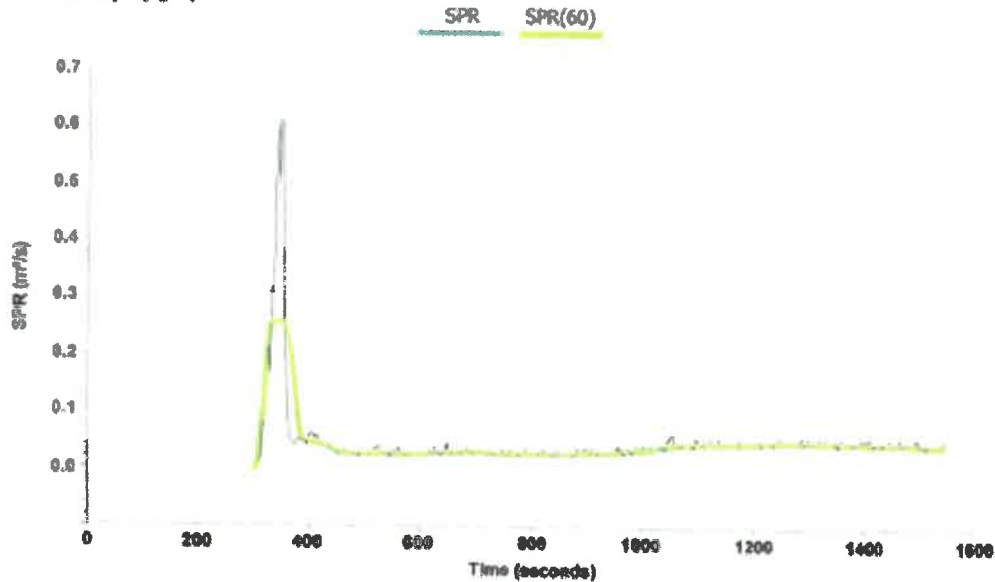
Report produced with the Fire Testing Technology SBICalc software

page 3

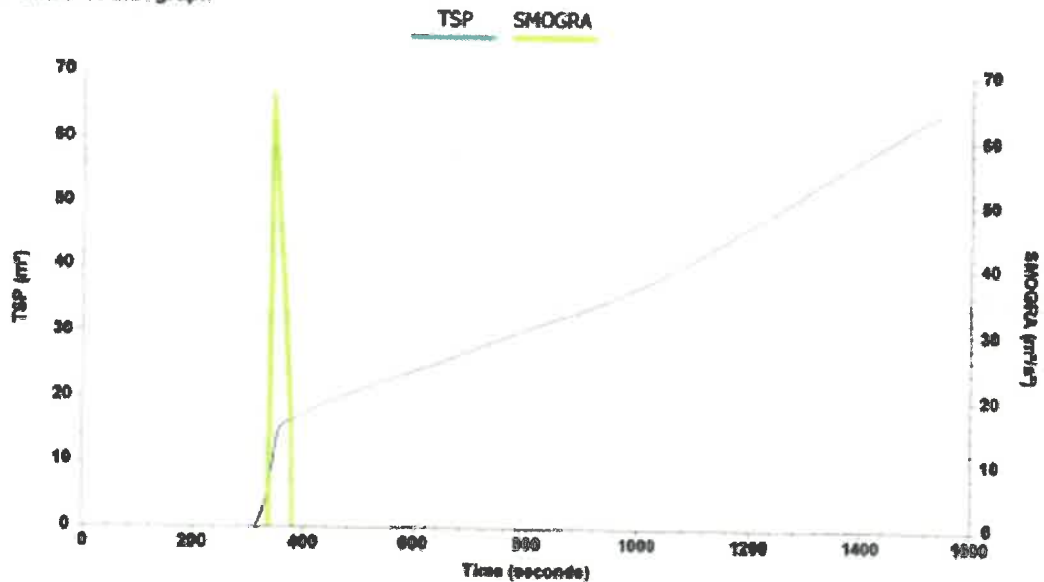
SBI Test Report

Laboratory name INEGI - LFF
Operator Bruno Nogueira
Filename C:\SBICALC\DATA\19040006.RW1
Report identification LFF.2019.074
Product identification SURFORMA-N1

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.

Os resultados apresentados referem-se exclusivamente aos provetes ensaiados

Este documento não pode ser reproduzido, exceto integralmente, sem autorização por escrito do INEGI.

1.543.06

SBI Test Report

Laboratory name INEGI - LFF
 Operator Bruno Nogueira
 Filename C:\SBI\CALC\DATA\19040007.RW1
 Report identification LFF.2019.074
 Product identification SURFORMA CPL 0.4 A 0.8 MM

Test		Pre-test conditions		Specimen conditioning	
Standard used	EN 13823:2010	Baseline duct temperature	292.61 K	Method	Constant mass
Date of test	05/04/2019	Ambient temperature	288.94 K	Time interval	195 hours
Date of report	05/04/2019	Ambient pressure	98.963 kPa	Mass 1	1810 g
E'	17.2 MJ/m ²	Relative humidity	46%	Mass 2	1810 g
Apparatus specifications		Baseline conditions		Temperature	
kt	0.823	Baseline ambient oxygen	20.730%	23°C	
kp	1.08	Baseline oxygen	20.951%	RH	
Duct diameter	0.315 m	Baseline carbon dioxide	0.0840%	50%	
O2 calibration delay time	11 s	Baseline smoke	99.60%		
CO2 calibration delay time	13 s				

Specimen information		Mounting method	
Thickness	0.6 mm	5.2.2a) in EN 13823:2002	
Density	1340 kg/m ³	Joints	none
Surface mass/area	0.8 kg/m ²	Fixed to substrate?	No
Specimen number	2	Fixing method	N/A
Date of arrival	28/03/2019	Substrate	none
		Manufacturer	SONAE INDÚSTRIA REVESTIMENTOS SA
		Sponsor	SONAE INDÚSTRIA REVESTIMENTOS SA

Test validity criteria				Burner details	
Test drifts				Burner HRR	
	Initial	Final	Change	27.589 kW	
Oxygen	20.951%	20.906%	0.045%	Burner HRR std. dev.	
CO2	0.084%	0.092%	0.008%	0.669 kW	
Smoke	99.60%	97.64%	0.020	Burner CO2/O2 ratio	
Exposure time 1254 s				0.832	
Synchronization details				Burner SPR	
Duct temp. dropped by 2.5 K from baseline of 317.08 K at 303 s				0.027 m ² /s	
Oxygen rose by 0.05% from baseline of 20.644% at 300 s				Burner SPR std. dev.	
CO2 dropped by 0.02% from baseline of 0.339% at 300 s				0.005 m ² /s	
				Burner response time	
				9 s	
				Other checks	
				Minimum duct flow	
				0.474 m ² /s	
				Maximum duct flow	
				0.556 m ² /s	
				No T/C failure	

Classification results		Classification observations		Potential classification	
FIGRA(0.2)	396.1 W/s at 339 s	LFS to edge?	No	Class	0
FIGRA(0.4)	350.4 W/s at 351 s	FDP flaming <= 10s?	Yes	Smoke production	s2
THR(600)	2.6 MJ	FDP flaming > 10s?	No	Flaming droplets/particles	d1
SMOGRA	81.4 m ² /s ² at 336 s				
TSP(600)	35.7 m ²				

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 Aos 320 s, Abertura d fendas na camada superficial. Aos 340 s, início da destruição do material no canto. Aos 420 s, destruição do material no canto até à altura de 60 cm.

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.

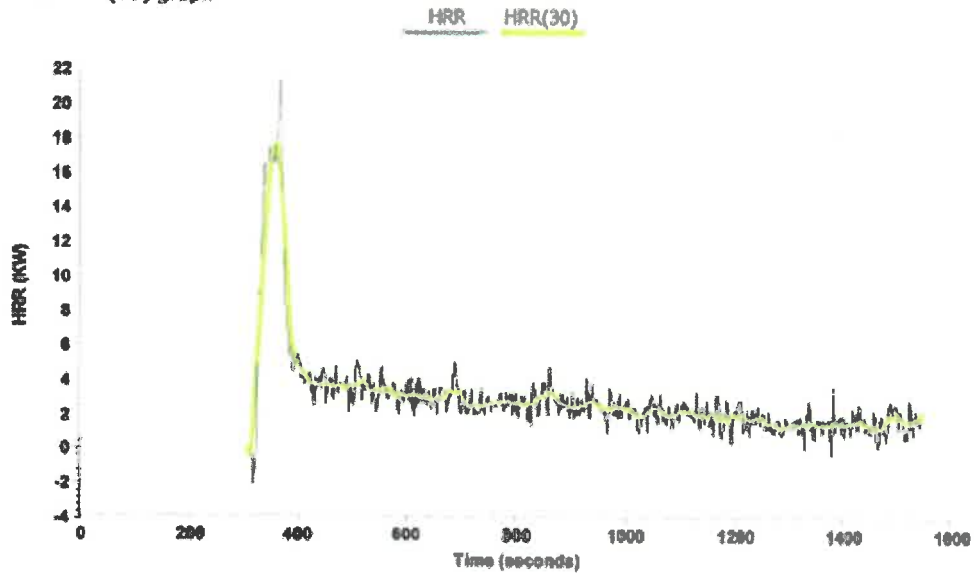
Report produced with the Fire Testing Technology SBTCalc software

page 2

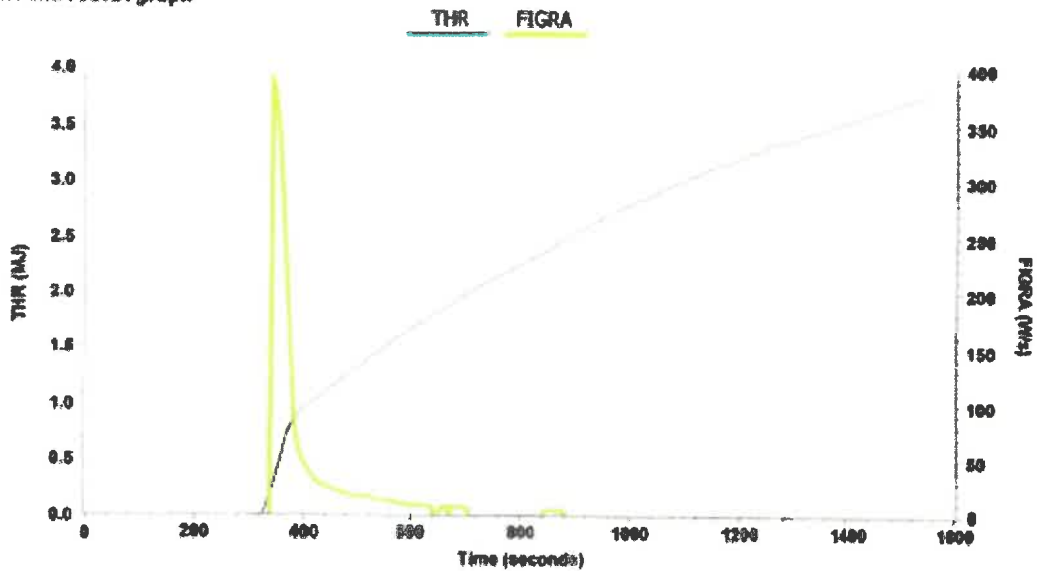
SBI Test Report

Laboratory name INEGI - LFF
Operator Bruno Nogueira
Filename C:\SBICALC\DATA\19040007.RW1
Report identification LFF.2019.074
Product identification SURFORMA CPL 0.4 A 0.8 MM

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.

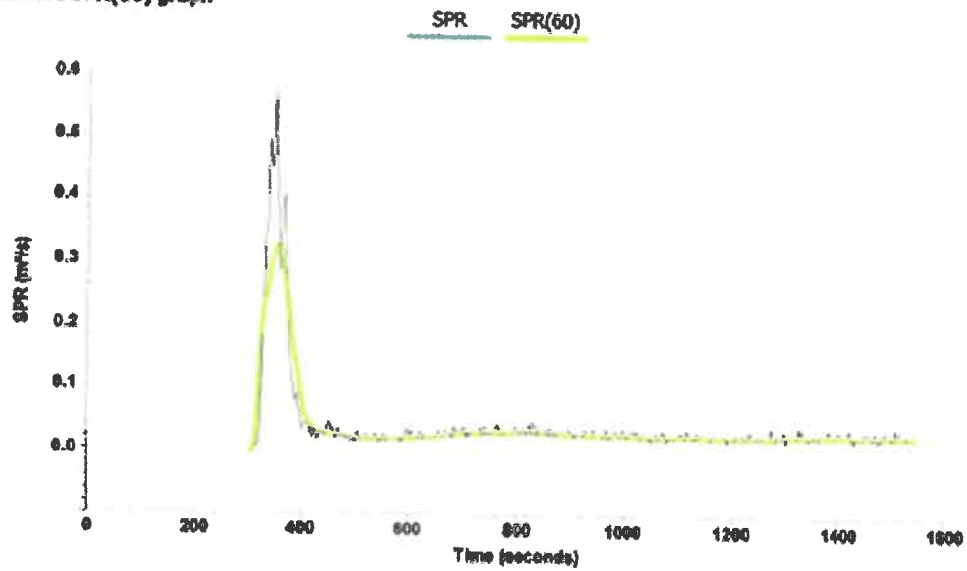
Report produced with the Fire Testing Technology SBICalc software

page 3

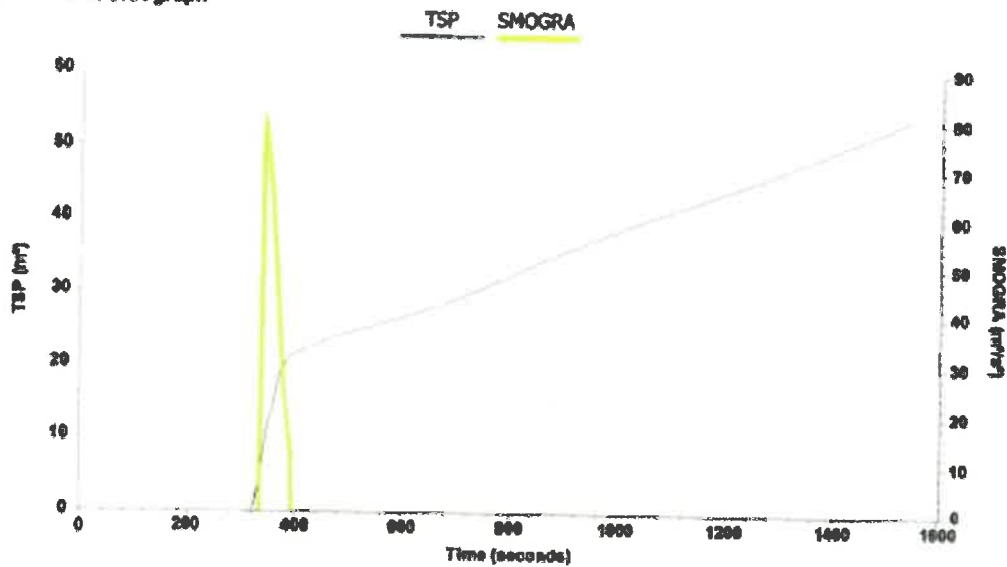
SBI Test Report

Laboratory name INEGI - LFF
Operator Bruno Nogueira
Filename C:\SBICALC\DATA\19040007.RW1
Report identification LFF.2019.074
Product identification SURFORMA CPL 0.4 A 0.8 MM

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 1

SBI Test Report

Laboratory name INEGI - LFF
 Operator Bruno Nogueira
 Filename C:\SBI\CALC\DATA\19040008.RW1
 Report identification LFF.2019.074
 Product identification SURFORMA CPL 0.4 A 0.8 MM

Test		Pre-test conditions		Specimen conditioning	
Standard used	EN 13823:2010	Baseline duct temperature	295.51 K	Method	Constant mass
Date of test	08/04/2019	Ambient temperature	296.00 K	Time interval	265 hours
Date of report	08/04/2019	Ambient pressure	100.388 kPa	Mass 1	1930 g
E ¹	17.2 MJ/m ³	Relative humidity	48%	Mass 2	1930 g
Apparatus specifications		Baseline conditions		Temperature	23°C
kt	0.823	Baseline ambient oxygen	20.678%	RH	50%
kp	1.08	Baseline oxygen	20.950%		
Duct diameter	0.315 m	Baseline carbon dioxide	0.0804%		
O2 calibration delay time	11 s	Baseline smoke	99.96%		
CO2 calibration delay time	13 s				

Specimen information			
Thickness	0.7 mm	Mounting method	5.2.2a) in EN 13823:2002
Density	1225 kg/m ³	Joints	none
Surface mass/area	0.85 kg/m ²	Faced to substrate?	No
Specimen number	3	Fixing method	N/A
Date of arrival	28/03/2019	Substrate	none
		Manufacturer	SONAE INDÚSTRIA DE REVESTIMENTOS SA
		Sponsor	SONAE INDÚSTRIA DE REVESTIMENTOS SA

Test validity criteria			
Test drifts			
	Initial	Final	Change
Oxygen	20.950%	20.943%	0.007%
CO2	0.080%	0.089%	0.008%
Smoke	99.96%	99.40%	0.006
Exposure time	594 s		
Synchronisation details			
Duct temp. dropped by 2.5 K from baseline of 320.18 K at 303 s			
Oxygen rose by 0.05% from baseline of 20.647% at 300 s			
CO2 dropped by 0.02% from baseline of 0.331% at 303 s			
Burner details			
Burner HRR			27.186 kW
Burner HRR std. dev.			0.575 kW
Burner CO2/O2 ratio			0.827
Burner SPR			0.022 m ³ /s
Burner SPR std. dev.			0.004 m ³ /s
Burner response time			9 s
Other checks			
Minimum duct flow			0.488 m ³ /s
Maximum duct flow			0.560 m ³ /s
No T/C failure			

Classification results		Classification observations		Potential classification	
FIGRA(0.2)	415.8 W/s at 333 s	LFS to edge?	No	Class	C
FIGRA(0.4)	231.8 W/s at 348 s	FDP flaming <= 10s?	No	Smoke production	s2
THR(600)	2.1 MJ	FDP flaming > 10s?	No	Flaming droplets/particles	d0
SMOGRA	41.4 m ² /s ² at 342 s				
TSP(600)	28.8 m ²				

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

Pre-test comments

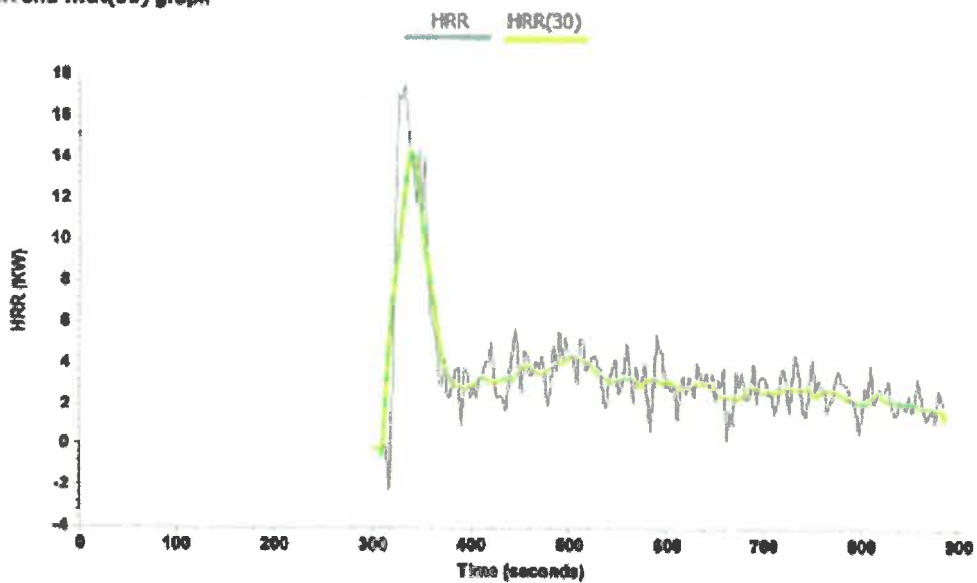
After-test comments Aos 340 s, início da destruição no canto. Aos 400 s, destruição completa no canto até 60 cm de altura. Queda de fragmentos queimados.

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.

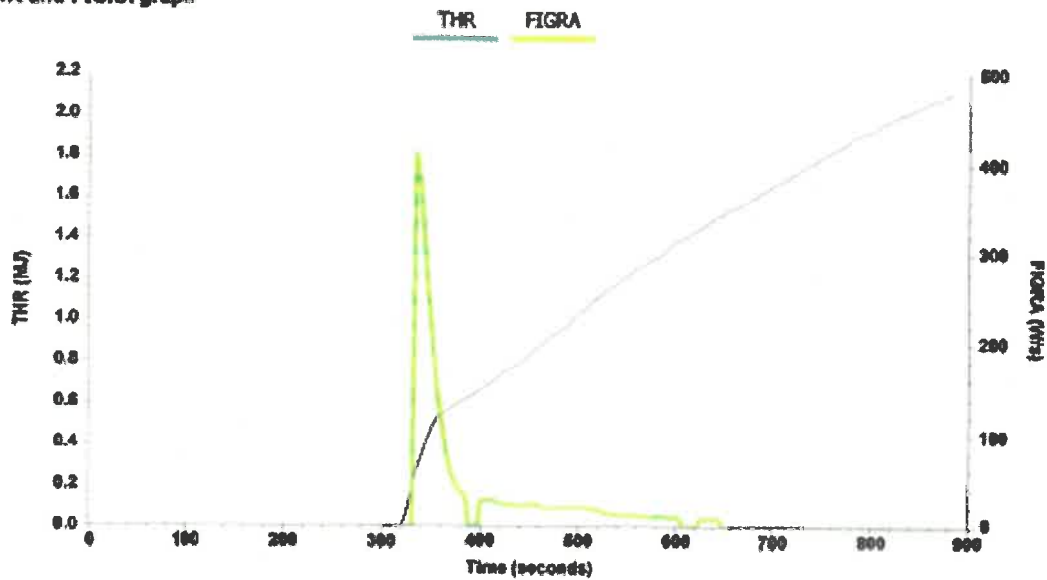
SBI Test Report

Laboratory name INEGI - LFF
Operator Bruno Nogueira
Filename C:\SBICALC\DATA\19040008.RW1
Report identification LFF.2019.074
Product identification SURFORMA CPL 0.4 A 0.8 MM

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.

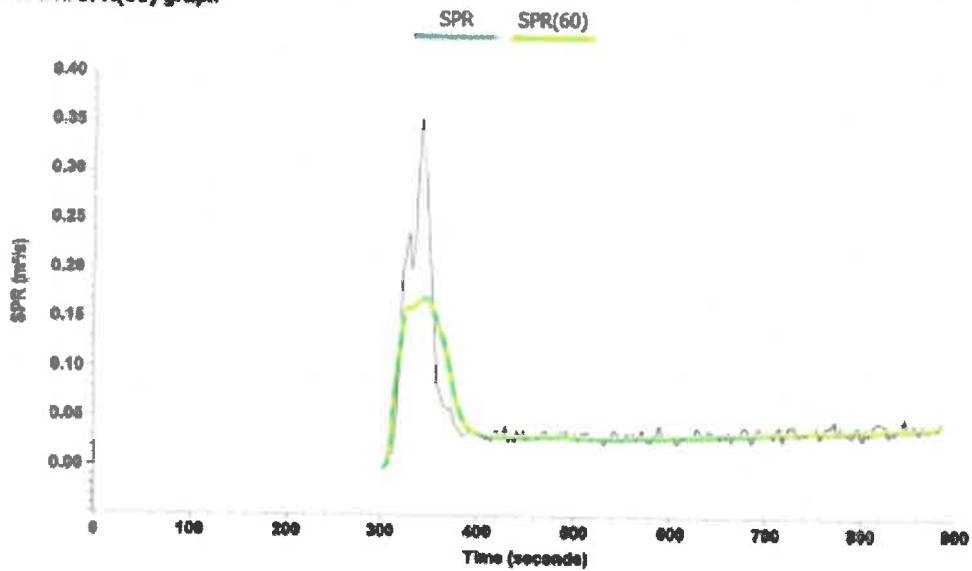
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page 3

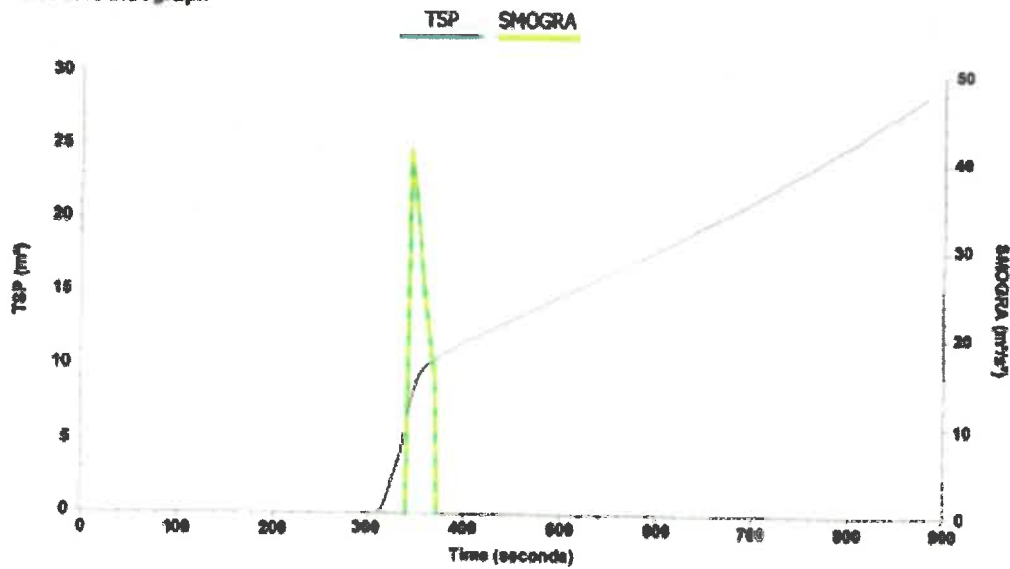
SBI Test Report

Laboratory name INEGI - LFF
Operator Bruno Nogueira
Filename C:\SBICALC\DATA\19040008.RW1
Report identification LFF.2019.074
Product identification SURFORMA CPL 0.4 A 0.8 MM

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.



INEGI
Campus da FEUP
Rua Dr. Roberto Frias, 400
4200-465 Porto
PORTUGAL

✉ inegi@inegi.up.pt
☎ +351 229578710
☎ +351 229537352



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www.inegi.up.pt

