TEST REPORT

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

Material Reference: Print MS 40 FR

Request Reference: Proposal PE2617029

Request Date: 2017-11-14

Reception Date: 2017-11-21

Test Date: 2017-12-15 to 2017-12-20

Report N. 31/LFF/17

Determination of Fire Reaction Classification

1 - Scope

The reported tests concern the determination of the fire reaction of a mesh coated fabric, made by Endutex, with reference **Print MS 40 FR** and 628 kg/m^3 density, to be used in indoors.

2 - Methodology

The tests were performed as indicated in the standard EN ISO 11925-2 issued of 2010 and standard EN 13823:2010+A1 issued of 2014. The classification method was applied according the standard NP EN 13051-1:2007+A1 issued of 2013.

3 – Specimens

3.1 – Dimension and conditioning

The specimens were prepared by the client and had the following dimensions:

Specimens	Lenght (mm)	Width (mm)	Thickness (mm)	Mass (g)
31/LFF/17/01	250	91	0.5	7.1
31/LFF/17/02	252	92	0.5	7.2
31/LFF/17/03	252	92	0.5	7.2
31/LFF/17/04	249	90	0.5	7.0
31/LFF/17/05	251	92	0.5	7.2
31/LFF/17/06	251	92	0.5	7.2
31/LFF/17/07	251	92	0.5	7.1
31/LFF/17/08	249	91	0.5	7.0
31/LFF/17/09	250	91	0.5	7.0
31/LFF/17/10	251	91	0.5	7.2
31/LFF/17/11	252	92	0.5	7.2
31/LFF/17/12	252	92	0.5	7.2
31/LFF/17/13	1501	1001	0.5	466
31/LFF/17/13	1502	502	0.5	240
31/LFF/17/14	1500	1001	0.5	449
31/LFF/17/14	1501	502	0.5	231
31/LFF/17/15	1501	1002	0.5	483
31/LFF/17/15	1503	503	0.5	256

Before being tested the specimens were conditioned for a minimum period of 600 hours at 23 ± 2 °C and 50 ± 5 % relative humidity

3.2 – Mounting of specimen

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

4 - Results

4.1 – Ignitability test (EN ISO 11925-2)

Position of flame application	Edge

Specimens	31/LFF/17/01	31/LFF/17/02	31/LFF/17/03	31/LFF/17/04	31/LFF/17/05	31/LFF/17/06
Flame application time (s)	30	30	30	30	30	30
Ignition (s)	1	1	1	1	1	1
F_s (mm)	Not reached	Not reached	Not reached	Not reached	Not reached	Not reached
Flame extintion (s)	8	9	10	8	8	10
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	31/LFF/17/07	31/LFF/17/08	31/LFF/17/09	31/LFF/17/10	31/LFF/17/11	31/LFF/17/12
Flame application time (s)	30	30	30	30	30	30
Ignition (s)	2	2	2	2	2	2
F_s (mm)	Not reached	Not reached	Not reached	Not reached	Not reached	Not reached
Flame extintion (s)	16	16	18	17	16	17
Droplets/Particles	No	No	No	No	No	No
Ignition of the filter paper	No	No	No	No	No	No

F_s: Vertical Flame Spread17

4.2 – Single burning item test (EN 13823)

Specimens	31/LFF/17/13	31/LFF/17/14	31/LFF/17/15	AVERAGE
FIGRA $_{0.2\,MJ}$ (W/s)	38.4	TNR	TNR	12.8
THR $_{600\,s}$ (MJ)	1.0	0.6	0.4	0.7
LFS (m)	No	No	No	No
FIRE BEHAVIOUR	A2/B	A2/B	A2/B	B
SMOGRA (m^2/s^2) (*)	273.3	370.8	247.5	297.2
TSP $_{600s}$ (m^2) (*)	196.6	184.0	158.7	179.8
SMOKE PRODUCTION	s3	s3	s3	s3
FLAMINNG 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
SMOGRA: Smoke growth rate TSP: Total smoke production TNR – Threshold not reached

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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	3	,	d	0

This classification is valid if specimens are free standing (paragraph 5.2.2.a. of EN 13823)

Porto, January 02, 2018

Technical Manager
inegi
LFF - Laboratório de Fumo e Fogo
João Rodrigues

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.

ANNEX 1

Photographs of the mounting specimens

Figure 1 – View of mounting.

Figure 2 – The SBI test.

Figure 3 – The SBI test.

Figure 4 – Specimens following testing in the SBI.

ANNEX 2

SBI Test Reports

Fire Test Certificate – Specimen

Fabric: PVC Mesh (Digital Print)
Type: EN13501-1

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SBI Test Report

Laboratory name	LFF
Operator	João Rodrigues
Filename	C:\SBICALC\DATA\17120002.RW1
Report identification	31/LFF/17/13
Product identification	Print MS 40 FR

Test

Standard used	EN 13823:2010
Date of test	19/12/2017
Date of report	19/12/2017
E'	17.2 MJ/m³

Apparatus specifications

kt	0.893
kp	1.08
Duct diameter	0.315 m
O2 calibration delay time	6 s
CO2 calibration delay time	9 s

Pre-test conditions

Baseline duct temperature	295.91 K
Ambient temperature	295.50 K
Ambient pressure	102.008 kPa
Relative humidity	47%

Baseline conditions

Baseline ambient oxygen	20.680%
Baseline oxygen	20.948%
Baseline carbon dioxide	0.0847%
Baseline smoke	99.97%

Specimen conditioning

Method	Constant mass
Time interval	670 hours
Mass 1	466 g
Mass 2	240 g
Temperature	23°C
RH	50%

Specimen information

Thickness	0.5 mm
Density	628 kg/m³
Surface mass/area	0.314 kg/m²
Specimen number	
Date of arrival	21/11/2017
Mounting method	5.2.2a) in EN 13823:2002
Joints	none
Fixed to substrate?	No
Fixing method	N/A
Substrate	none
Manufacturer	Endutex
Sponsor	

Test validity criteria

Test drifts

	Initial	Final	Change
Oxygen	20.948%	20.952%	0.004%
CO2	0.085%	0.089%	0.004%
Smoke	99.97%	99.32%	0.007

Exposure time 1254 s

Synchronisation details

Duct temp. dropped by 2.5 K from baseline of 322.18 K at 303 s
Oxygen rose by 0.05% from baseline of 20.624% at 309 s
CO2 dropped by 0.02% from baseline of 0.343% at 303 s

Burner details

Auxiliary Burner HRR	30.537 kW
Auxiliary Burner HRR std. dev.	0.765 kW
Burner CO2/O2 ratio	0.797
Auxiliary Burner SPR	0.026 m²/s
Auxiliary Burner SPR std. dev.	0.005 m²/s
Burner response time (s)	12 s

Other checks

Minimum duct flow	0.494 m³/s
Maximum duct flow	0.595 m³/s

No T/C failure

Classification results

FIGRA(0.2)	38.4 W/s at 408 s
FIGRA(0.4)	23.2 W/s at 456 s
THR(600)	1.0 MJ
SMOGRA	273.3 cm²/s² at 318 s
TSP(600)	196.6 m²

Classification observations

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

Potential classification

Class	A2/B
Smoke production	s3
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.

Fire Test Certificate – Specimen

Fabric: PVC Mesh (Digital Print)
Type: EN13501-1

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SBI Test Report

Laboratory name	LFF
Operator	João Rodrigues
Filename	C:\SBICALC\DATA\17120002.RW1
Report identification	31/LFF/17/13
Product identification	Print MS 40 FR

Alternative smoke results

Smoke test filename	C:\SBICALC\SMOKE\17121901.RW1
Main burner SPR	0.051 m²/s
Main burner SPR std. dev.	0.007 m²/s

Alternative classification results

SMOGRA	241.0 cm²/s² at 318 s
TSP(600)	181.4 m²
Smoke production class	s3

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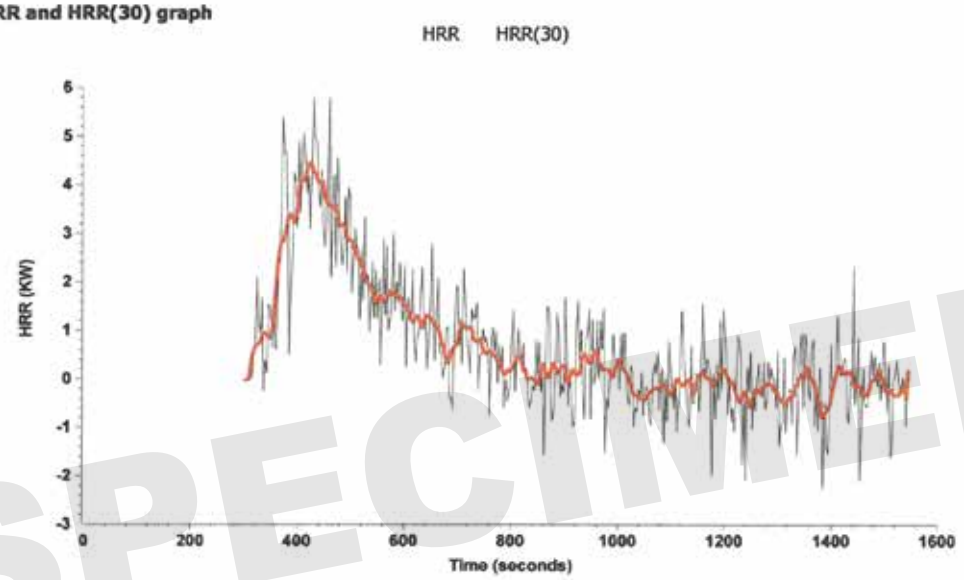
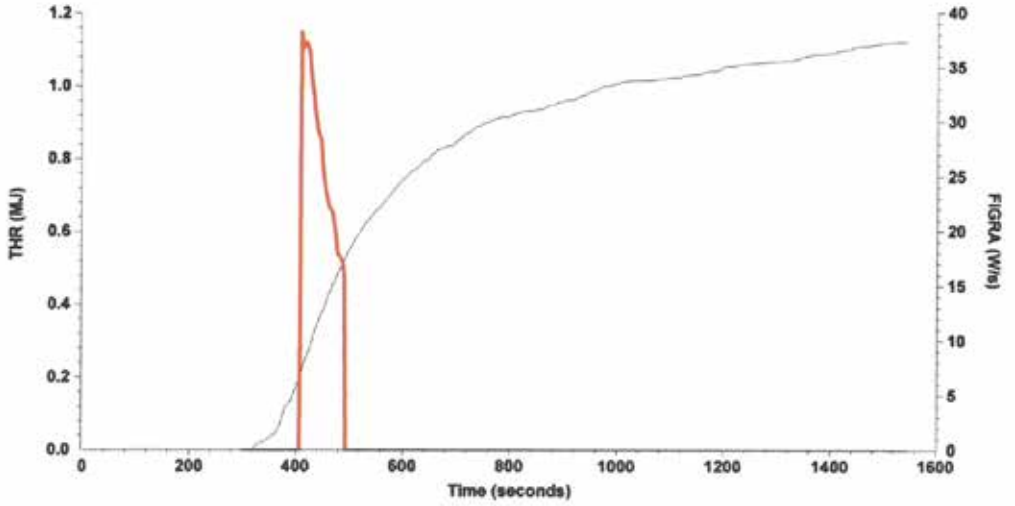
Product identification	Print MS 40 FR

HRR and HRR(30) graph



THR and FIGRA graph



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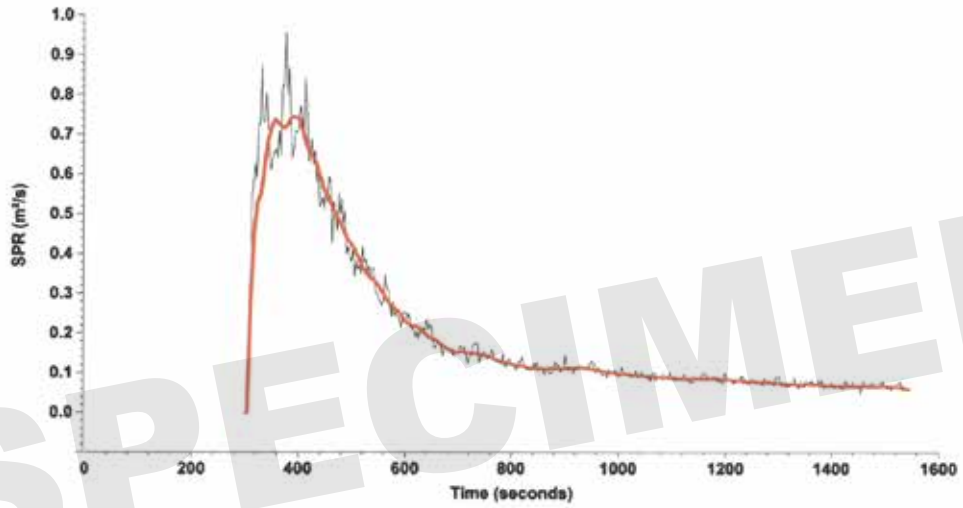
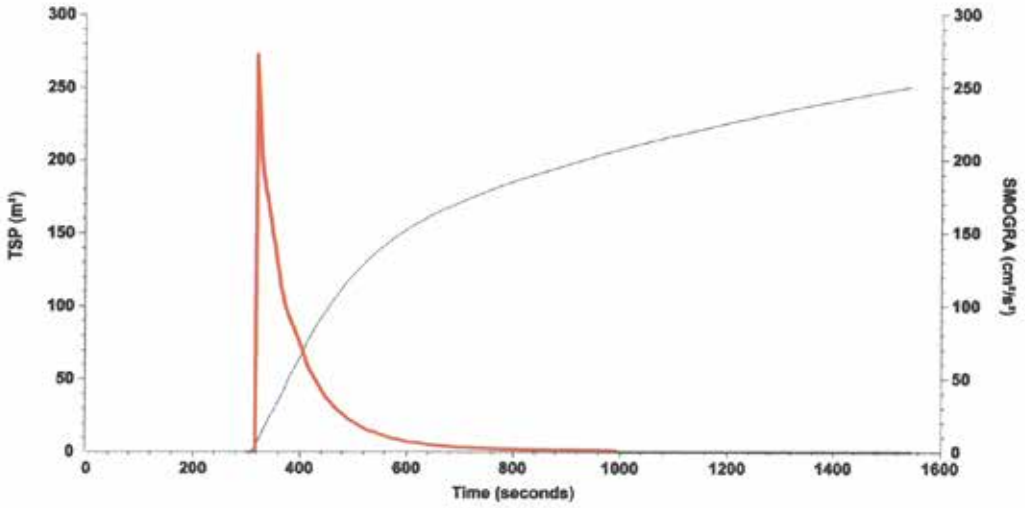
SPR and SPR(60) graph



TSP and SMOGRA graph



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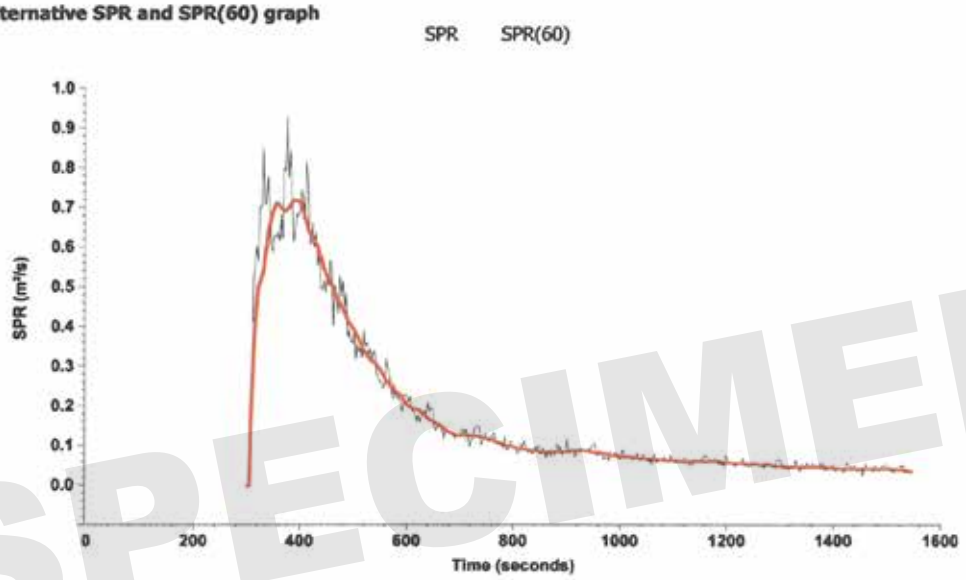
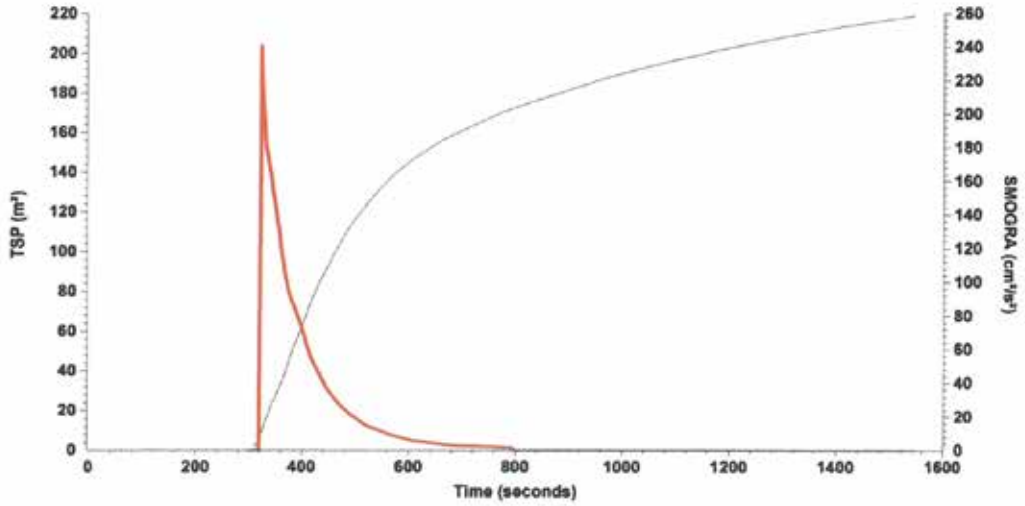
Product identification	Print MS 40 FR

Alternative SPR and SPR(60) graph



Alternative TSP and SMOGRA graph



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Type: EN13501-1

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Filename	C:\SBICALC\DATA\17120003.RW1
Report identification	31/LFF/17/14
Product identification	Print MS 40 FR

Test

Standard used	EN 13823:2010
Date of test	19/12/2017
Date of report	19/12/2017
E'	17.2 MJ/m³

Apparatus specifications

kt	0.893
kp	1.08
Duct diameter	0.315 m
O2 calibration delay time	6 s
CO2 calibration delay time	9 s

Pre-test conditions

Baseline duct temperature	295.97 K
Ambient temperature	296.10 K
Ambient pressure	101.894 kPa
Relative humidity	46%

Baseline conditions

Baseline ambient oxygen	20.687%
Baseline oxygen	20.951%
Baseline carbon dioxide	0.0918%
Baseline smoke	99.98%

Specimen conditioning

Method	Constant mass
Time interval	674 hours
Mass 1	449 g
Mass 2	231 g
Temperature	23°C
RH	50%

Specimen information

Thickness	0.5 mm
Density	628 kg/m³
Surface mass/area	0.314 kg/m²
Specimen number	
Date of arrival	21/11/2017
Mounting method	5.2.2a) in EN 13823:2002
Joints	none
Fixed to substrate?	No
Fixing method	N/A
Substrate	none
Manufacturer	Endutex
Sponsor	

Test validity criteria

Test drifts

	Initial	Final	Change
Oxygen	20.951%	20.950%	0.001%
CO2	0.092%	0.096%	0.004%
Smoke	99.98%	99.49%	0.005

Exposure time 1254 s

Synchronisation details

Duct temp. dropped by 2.5 K from baseline of 322.17 K at 303 s
Oxygen rose by 0.05% from baseline of 20.625% at 309 s
CO2 dropped by 0.02% from baseline of 0.349% at 303 s

Burner details

Auxiliary Burner HRR	30.647 kW
Auxiliary Burner HRR std. dev.	0.672 kW
Burner CO2/O2 ratio	0.789
Auxiliary Burner SPR	0.026 m²/s
Auxiliary Burner SPR std. dev.	0.005 m²/s
Burner response time (s)	12 s

Other checks

Minimum duct flow	0.495 m³/s
Maximum duct flow	0.592 m³/s

No T/C failure

Classification results

FIGRA(0.2)	threshold not reached
FIGRA(0.4)	threshold not reached
THR(600)	0.6 MJ
SMOGRA	370.8 cm²/s² at 318 s
TSP(600)	184.0 m²

Classification observations

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

Potential classification

Class	A2/B
Smoke production	s3
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.

Fire Test Certificate – Specimen

Fabric: PVC Mesh (Digital Print)
Type: EN13501-1

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Laboratory name	LFF
Operator	João Rodrigues
Filename	C:\SBICALC\DATA\17120003.RW1
Report identification	31/LFF/17/14
Product identification	Print MS 40 FR

Alternative smoke results

Smoke test filename	C:\SBICALC\SMOKE\17121901.RW1
Main burner SPR	0.051 m^2/s
Main burner SPR std. dev.	0.007 m^2/s

Alternative classification results

SMOGRA	359.0 cm^2/s^2 at 318 s
TSP(600)	169.0 m^2
Smoke production class	s3

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Filename	C:\SBICALC\DATA\17120003.RW1
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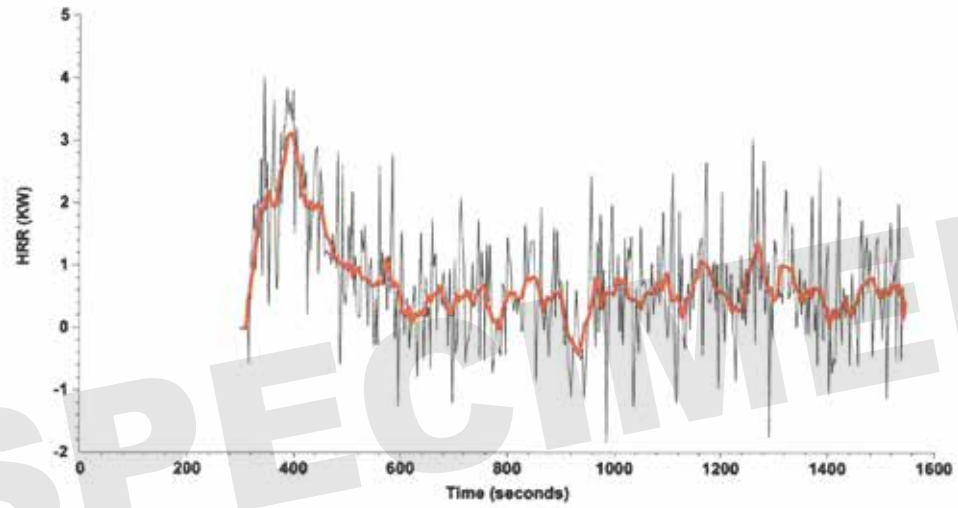
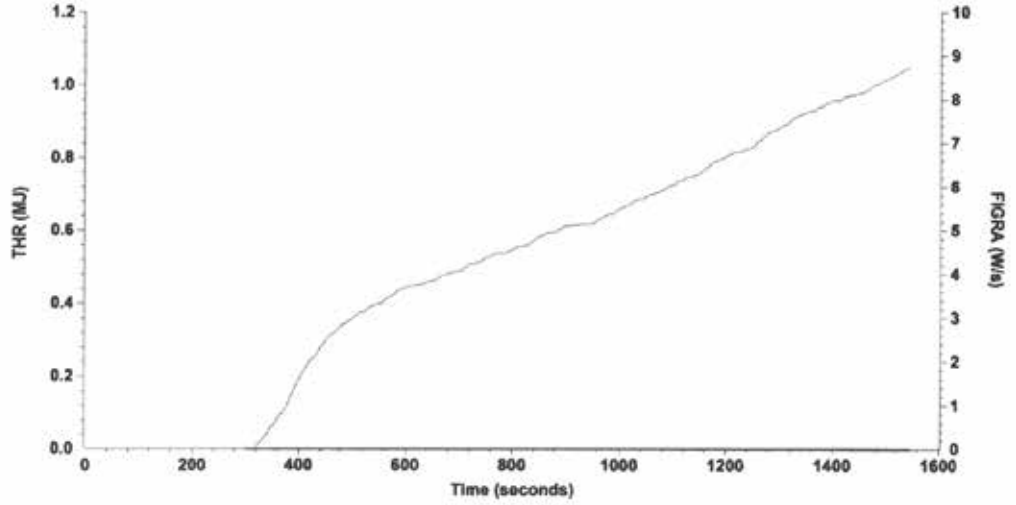
Product identification	Print MS 40 FR

HRR and HRR(30) graph



THR and FIGRA graph



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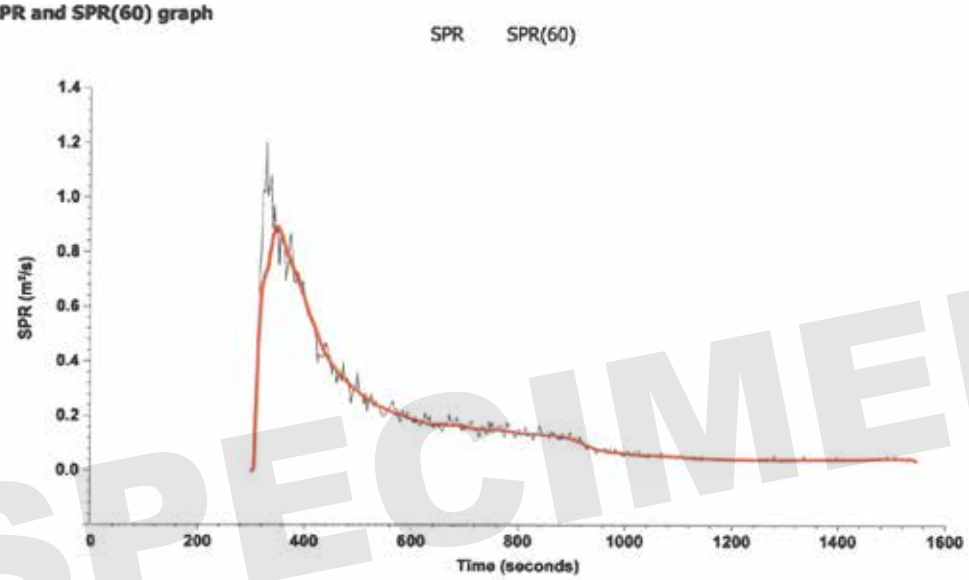
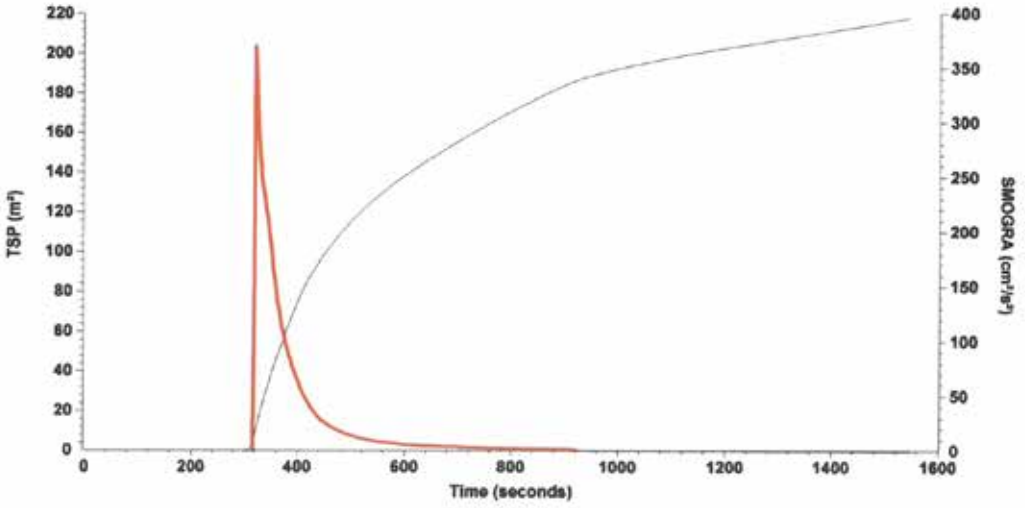
Product identification	Print MS 40 FR

SPR and SPR(60) graph



TSP and SMOGRA graph



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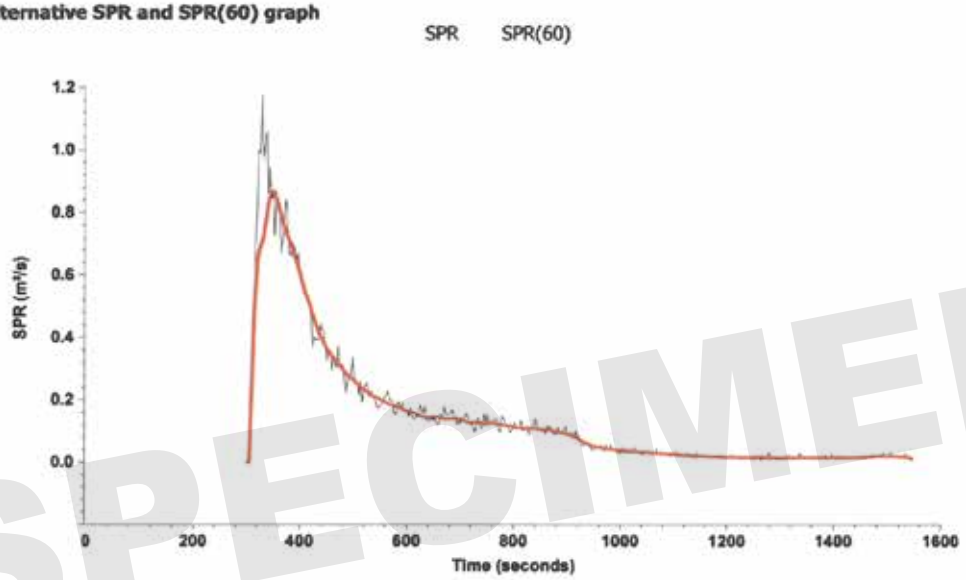
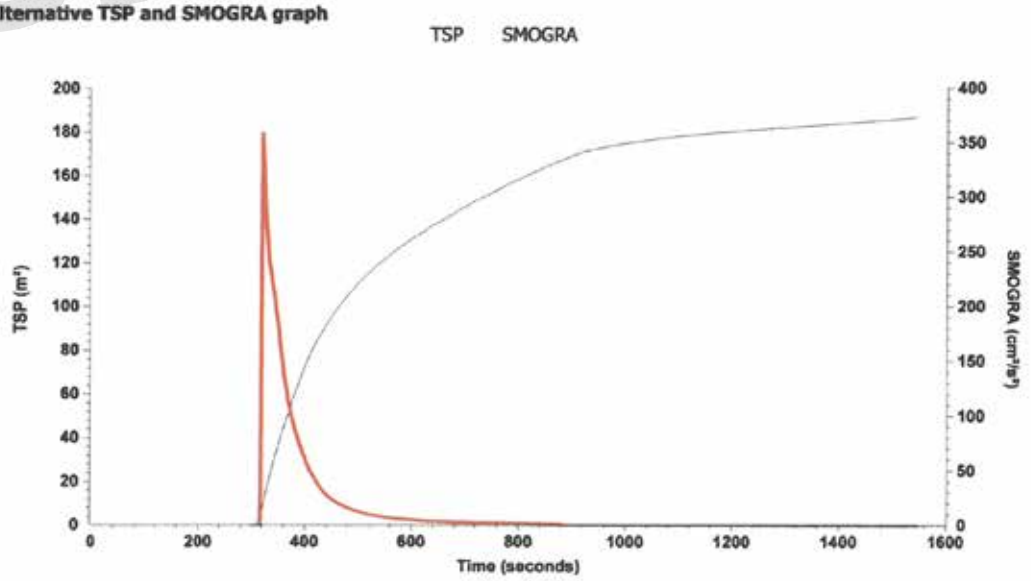
Product identification	Print MS 40 FR

Alternative SPR and SPR(60) graph



Alternative TSP and SMOGRA graph



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Filename	C:\SBICALC\DATA\17120004.RW1
Report identification	31/LFF/17/15
Product identification	Print MS 40 FR

Test

Standard used	EN 13823:2010
Date of test	20/12/2017
Date of report	20/12/2017
E'	17.2 MJ/m³

Apparatus specifications

kt	0.893
kp	1.08
Duct diameter	0.315 m
O2 calibration delay time	6 s
CO2 calibration delay time	9 s

Pre-test conditions

Baseline duct temperature	295.38 K
Ambient temperature	295.26 K
Ambient pressure	102.195 kPa
Relative humidity	45%

Baseline conditions

Baseline ambient oxygen	20.705%
Baseline oxygen	20.954%
Baseline carbon dioxide	0.0943%
Baseline smoke	100.01%

Specimen conditioning

Method	Constant mass
Time interval	698 hours
Mass 1	483 g
Mass 2	256 g
Temperature	23°C
RH	50%

Specimen information

Thickness	0.5 mm
Density	628 kg/m³
Surface mass/area	0.314 kg/m²
Specimen number	
Date of arrival	21/11/2017

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

Test validity criteria

Test drifts

	Initial	Final	Change
Oxygen	20.954%	20.956%	0.003%
CO2	0.094%	0.098%	0.004%
Smoke	100.01%	99.30%	0.007

Exposure time 1254 s

Synchronisation details

Duct temp. dropped by 2.5 K from baseline of 321.25 K at 303 s
Oxygen rose by 0.05% from baseline of 20.630% at 309 s
CO2 dropped by 0.02% from baseline of 0.347% at 303 s

Burner details

Auxiliary Burner HRR	30.740 kW
Auxiliary Burner HRR std. dev.	0.892 kW
Burner CO2/O2 ratio	0.783
Auxiliary Burner SPR	0.031 m²/s
Auxiliary Burner SPR std. dev.	0.006 m²/s
Burner response time (s)	15 s

Other checks

Minimum duct flow	0.502 m³/s
Maximum duct flow	0.584 m³/s
No T/C failure	

Classification results

FIGRA(0.2)	threshold not reached
FIGRA(0.4)	threshold not reached
THR(600)	0.4 MJ
SMOGRA	247.5 cm²/s² at 321 s
TSP(600)	158.7 m²

Classification observations

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

Potential classification

Class	A2/B
Smoke production	s3
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

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Fire Test Certificate – Specimen

Fabric: PVC Mesh (Digital Print)
Type: EN13501-1

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SBI Test Report

Laboratory name	LFF
Operator	João Rodrigues
Filename	C:\SBICALC\DATA\17120004.RW1
Report identification	31/LFF/17/15
Product identification	Print MS 40 FR

Alternative smoke results

Smoke test filename	C:\SBICALC\SMOKE\17122002.RW1
Main burner SPR	0.047 m²/s
Main burner SPR std. dev.	0.004 m²/s

Alternative classification results

SMOGRA	241.4 cm²/s² at 321 s
TSP(600)	149.4 m²
Smoke production class	s3

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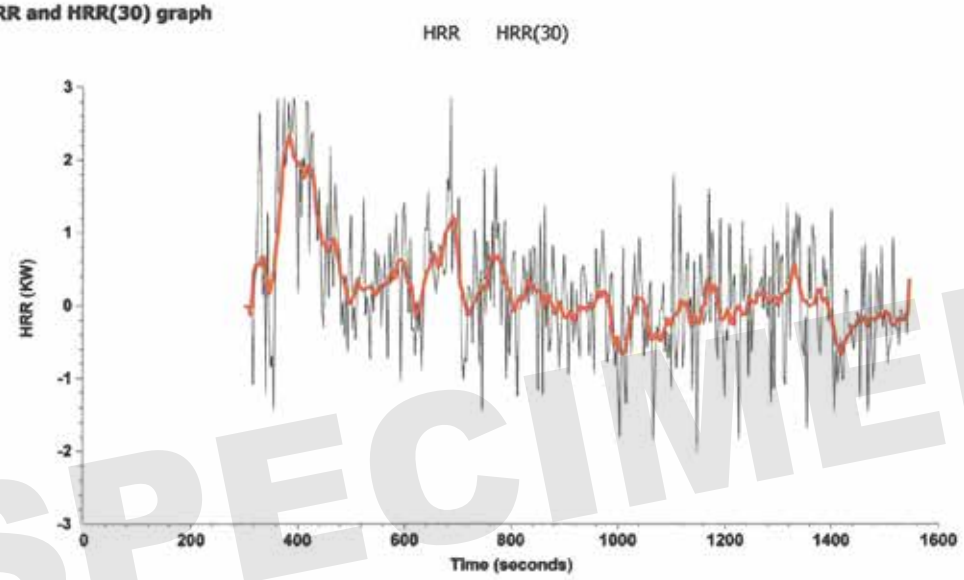
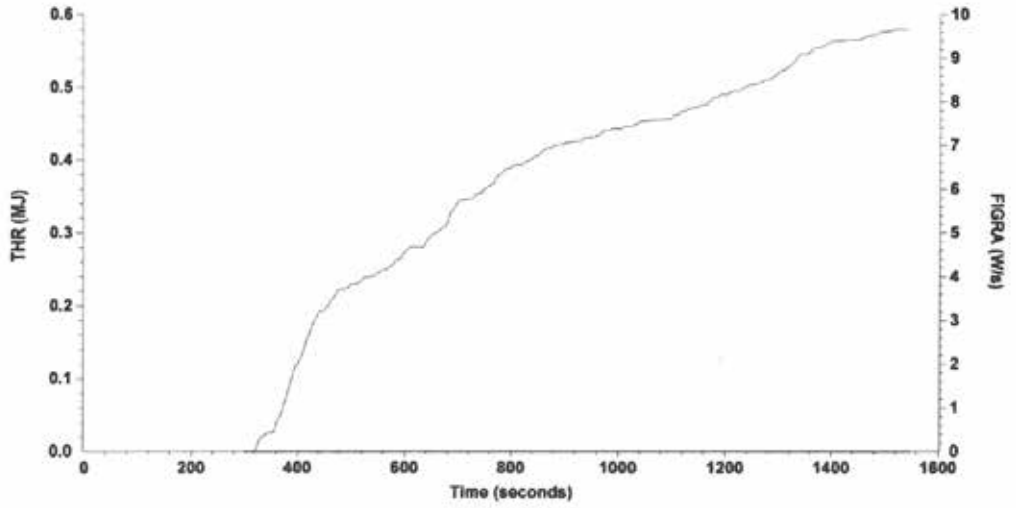
Product identification	Print MS 40 FR

HRR and HRR(30) graph



THR and FIGRA graph

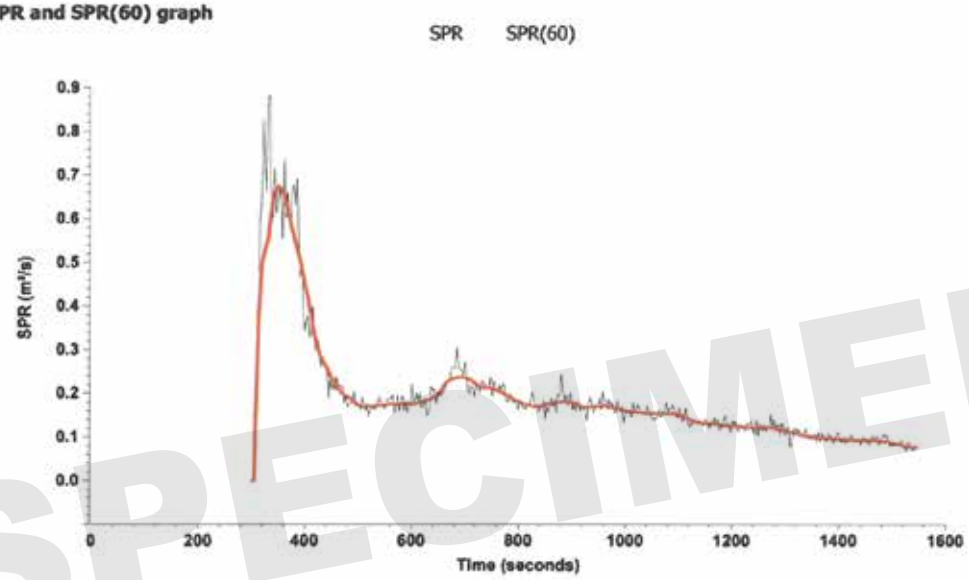


The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

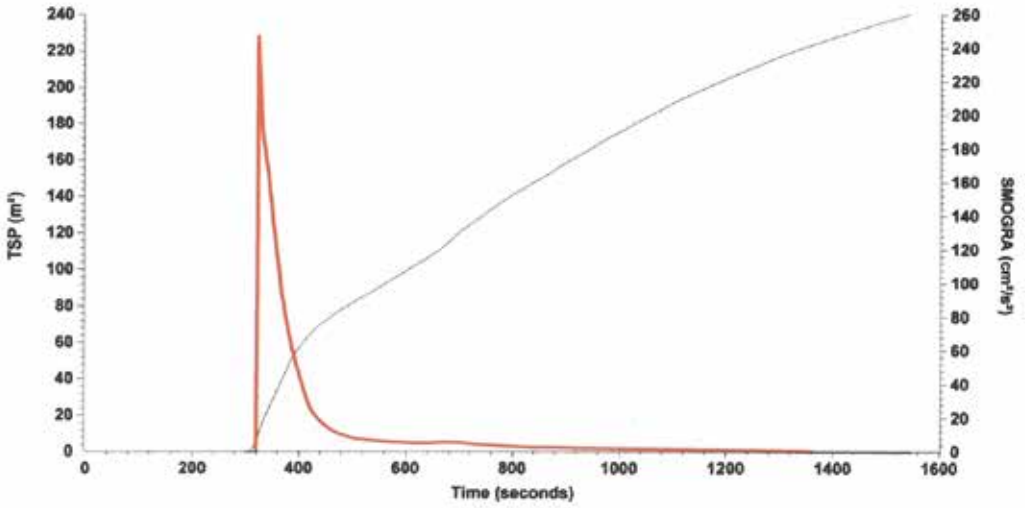
SBI Test Report

Laboratory name	LFF
Operator	João Rodrigues
Filename	C:\SBICALC\DATA\17120004.RW1
Report identification	31/LFF/17/15
Product identification	Print MS 40 FR

SPR and SPR(60) graph



TSP and SMOGRA graph

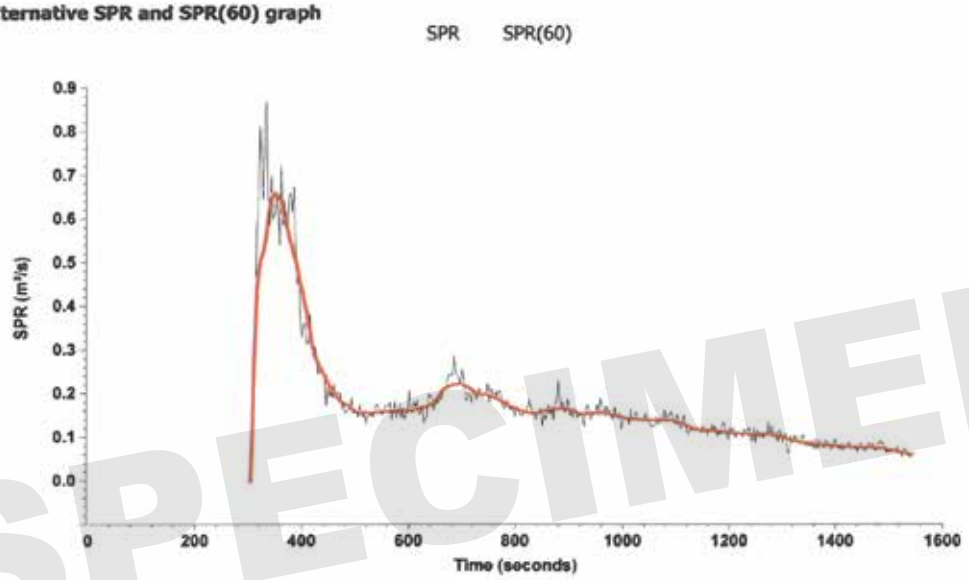


The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

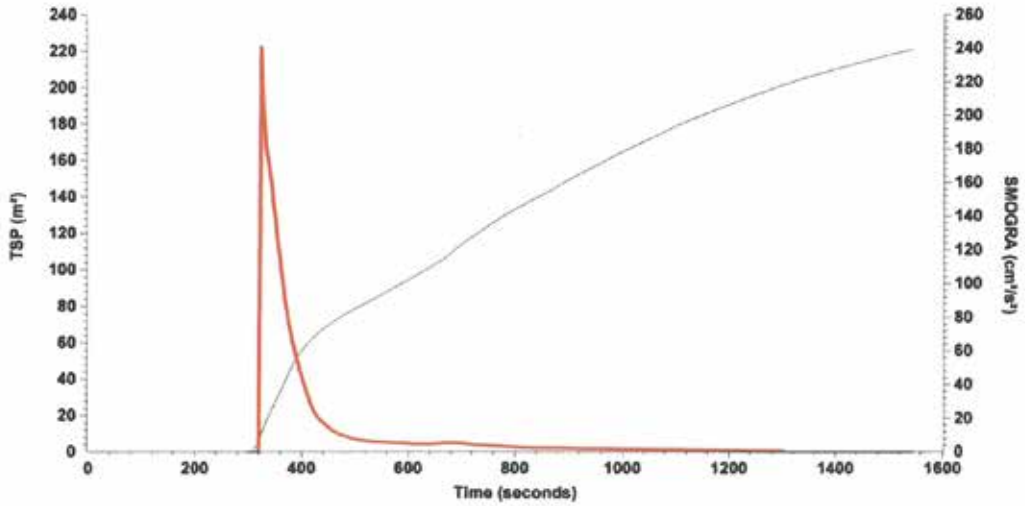
SBI Test Report

Laboratory name	LFF
Operator	João Rodrigues
Filename	C:\SBICALC\DATA\17120004.RW1
Report identification	31/LFF/17/15
Product identification	Print MS 40 FR

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.