for the proof of fire behaviour according to DIN 4102-1

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PÜZ-Stelle (LBO): BRA09

TEST REPORT

Reference: FLT 3600316 (Translation of the German test report - no guarantee for translation of technical terms)

Sponsor: Neschen Coating GmbH
Hans-Neschen-Straße 1
D - 31675 Bückeburg
(Germany)

Order: 2016-10-13 **Arrived:** 2016-10-14

Description of samples: Self-adhesive plastic films to be applied onto metal surfaces, named
"**solvoprint easy dot matt**",
"**solvoprint easy dot glossy**" and
"**solvoprint easy dot clear**".
(for details see page 2)

Delivered: 2016-10-14

Content of request: Proof of flammability to classify building materials to class B1 "schwerentflammbar" according to DIN 4102-1

Assessment: The examined material combinations meet the requirements of class B1 for "schwerentflammbare" (not easily flammable) building materials according to DIN 4102-1, if used suspended freely or with distance if >40 mm to the same or other plain materials.
(for details see page 7)

Validity of test report: 2021-11-30

Sampling: The sample material was sent to the laboratory by the sponsor.

Remark: If the above-mentioned building material is not used as product according to MBO § 2, there is no need for a general building supervisory test report.
This test report is not valid if the examined building material is used as product in the meaning of state building prescriptions (MBO § 17).

This test report does not replace an eventually necessary proof of applicability concerning building supervisory or building laws in the meaning of state building prescriptions. This has to be verified by:

- "allgemeine bauaufsichtliche Zulassung" (general building inspectorate approval) or by
- "allgemeines bauaufsichtliches Prüfzeugnis (general building inspectorate certificate) or by
- "Zustimmung im Einzelfall (exceptional approval).

This test report can serve as a basis for building supervisory procedures for:

- regulated building products for the pre scribed proofs of conformity
- non-regulated building products for the needed proofs of applicability.

This test report comprises 7 pages and 6 appendices.

1 Description of test material

1.1 Test material (according to the sponsor)

The materials delivered are self-adhesive plastic films consisting of a pvc-soft foil coloured in matt white, glossy white or matt transparent in a thickness of 100 µm, with an acrylate based adhesive on the rear side and a siliconized masking paper. The self-adhesive films are intended to be used indoor, applied onto metal surfaces. The following versions have been delivered:

Trade name: "solvoprint easy ...	Colours of film	Gloss	Adhesive strength
... dot matt"	white	matt	> 1,5 [N/25mm]
... dot glossy"	white	glossy	
... dot clear"	transparent	matt	

1.2 Description of the delivered samples

For the tests the laboratory received 3 different self-adhesive PVC-films with a white protective paper on the reverse side.
Characteristic values: see table 1; Photos: see enclosures;
Further specifications are not known by the laboratory, samples are stored.

2 Preparation of samples

From each type of the delivered materials 2 specimens were assembled. The samples (dimensions 1000 mm x 190 mm) of the test specimens A, C, E and G were cut in longitudinal and for test specimens B, D, F and H in transversal direction of the films and applied onto sheet aluminium (uncoated, thickness 1,0 mm). For the small burner tests ("Brennkastenprüfung") samples for edge flame exposure (dimensions 190 mm x 90 mm) and samples for surface flame exposure (dimensions 230 mm x 90 mm) have been cut in longitudinal and transversal direction and applied onto sheet aluminium (uncoated, thickness 1,0 mm). Afterwards all samples were kept in a climate chamber acc. DIN 50014-23/50-2 until they reached constant weight.

3 Arrangement of samples

The tests in the fire shaft ("Brandschacht") have been performed acc. DIN 4102-1 and -16 (building materials class B1). The small burner tests ("Brennkastenprüfungen") have been performed acc. DIN 4102-1, chapter 6.2.5 (building materials class B2). The films were glued on one side of the sheet aluminium, no additional substrate was arranged behind the material compound.
Examination period: December 2016

4 Results

- section 4.1 Material characteristics
- section 4.2.1 Test results class B2 (enclosures 5-6)
- section 4.2.2 Test results class B1

4.1 Material characteristics

Table 1

Type name: "solvoprint easy ...	Manufacturer's data		Measured values *)		
	Weight per area unit [g/m²]	Thickness [µm]	Weight per area unit [g/m²]	Thickness (m.v.) [mm]	s
... dot matt"	100 ± 10	135 ± 5	0,14	0,005	149
... dot glossy"			0,14	0,002	145
... dot clear"		125 ± 7	0,14	0,004	141
masking papers	175 ± 10	147 ± 7	149 ± 1	0,11 – 0,18	./.

m.v. mean value
s standard deviation
./. not received/not measured
*) including adhesive layer, without paper liner

4.2 Results of the fire behaviour

4.2.1 Test results class B2 (Brennkasten)

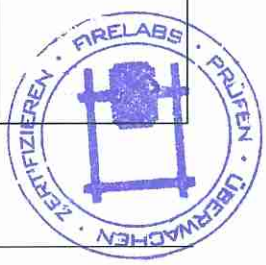
All building materials class B1 must also meet the requirements of materials class B2 (flammable). The material, tested in "Brennkasten" acc. DIN 50 050 meets the requirements of building materials class B2; the material did not show burning particles/droplets during these tests. (Results: see enclosures; tables 2.1-2.3)

4.2.2 Test results class B1 (Brandschacht)

Table 2.1

Test results "Brandschachtprüfung" (part 1)								
line no.		Test results						
		A	B	C	D	-	-	require-ments
1	Number of specimen arrangement acc. DIN 4102 –15 Table 1	7	7	7	7	-	-	
2	Maximal flame height above bottom edge ..... cm	50	60	50	60	-	-	*)
3	Time [1] ..... min	1	1	1	1	-	-	
4	Burning / melting through Time [1] ..... min	1	1	1	1	-	-	
5	Back side of the specimens: Flames / glowing Time [1] ..... min:s	./.	./.	./.	./.	-	-	
6	Discolouring Time [1] ..... min:s	./.	./.	./.	./.	-	-	
7	Falling of burning droplets Begin [1] ..... min	No	No	No	No	-	-	
8	Extend: Sporadic falling of burning droplets							
9	Continuous falling of burning droplets							
10	Falling of burning parts Begin [1] ..... min:s	No	No	No	No	-	-	
11	Extend: Sporadic falling of burning parts							
12	Continuous falling of burning parts							
13	Afterflame time at the bottom of the sieve (max.) ..... min:s	./.	./.	./.	./.	-	-	
14	Impairment of the burner flames by dropping or falling Material Time [1] ..... min:s	No	No	No	No	-	-	
15	Premature end of test	No	No	No	No	-	-	
16	Final occurrence of burning at the specimen [1] ..... min	10	10	10	10	-	-	
	Time of eventually end of test [1] ..... min:s	./.	./.	./.	./.			

[1] Indication of time: from the beginning of testing procedure
- Not tested
. /. Not occurred
*) No cause for complaint



Test results "Brandschachtprüfung" (part 2)								
line no.		Measured values specimen						require-ments
		A	B	C	D	-	-	
	Afterflame after end of test	No	No	No	No	-	-	
17	Time ..... min:s							
18	Number of specimen							
19	Front side of specimen							
20	Back side of specimen							
21	Flame length ..... cm							
	Afterglow after end of test	No	No	No	No	-	-	
22	Time ..... min:s							
23	Number of specimen							
	Place of appearance:							
24	Lower half of specimen							
25	Upper half of specimen							
26	Front side of specimen							
27	Back side of specimen							
	Smoke density							
28	≤ 400 % min	16,7	18,7	18,4	17,3	-	-	
29	≥ 400 % min (very strong smoke density)	./.	./.	./.	./.	-	-	
30	Diagram fig. no.	1	3	5	7	-	-	
	Residual length							
31	Individual value ..... cm	47	47	48	46	-	-	
		47	45	48	47	-	-	
		45	45	46	48	-	-	> 0
		46	48	46	45	-	-	
32	Average value ..... cm	**46**	**46**	**47**	**46**	-	-	≥ 15
33	Photo of the test specimen fig. no.	2	4	6	8	-	-	
	Flue gas temperature							
34	Maximum of average	111	112	113	116	-	-	≤ 200
35		9:32	10:00	9:42	9:30	-	-	
36		1	3	5	7	-	-	
37	Remarks: line 32: There were no additional tests proceeded because of the residual length of > 45 cm (DIN 4102-16: 2015-09, 5.2 b)). (diagrams and photos see enclosures)							

Specimen	Test-No.	Type name	Orientation	Substrate
A	600316-001	solvoprint easy dot matt	longitudinal	aluminium sheet
B	600316-002		transversal	
C	600316-003	solvoprint easy dot glossy	longitudinal	aluminium sheet
D	600316-004		transversal	

1) indication of time: from the beginning of testing procedure
- not tested
. /. not occurred
*) no cause for complaint

Table 2.2

Test results "Brandschachtprüfung" (part 1)								
line no.		Test results						
		E	F	G	H	-	-	require-ments
1	Number of specimen arrangement acc. DIN 4102 –15 Table 1	7	7	7	7	-	-	
2	Maximal flame height above bottom edge ..... cm	60	60	60	60	-	-	*)
3	Time [1] ..... min	1	1	1	1	-	-	
4	Burning / melting through Time [1] ..... min	1	1	1	1	-	-	
5	Back side of the specimens: Flames / glowing Time [1] ..... min:s	./.	./.	./.	./.	-	-	
6	Discolouring Time [1] ..... min:s	./.	./.	./.	./.	-	-	
7	Falling of burning droplets Begin [1] ..... min	No	No	No	No	-	-	
8	Extend: Sporadic falling of burning droplets							
9	Continuous falling of burning droplets							
10	Falling of burning parts Begin [1] ..... min:s	No	No	No	No	-	-	
11	Extend: Sporadic falling of burning parts							
12	Continuous falling of burning parts							
13	Afterflame time at the bottom of the sieve (max.) ..... min:s	./.	./.	./.	./.	-	-	
14	Impairment of the burner flames by dropping or falling Material Time [1] ..... min:s	No	No	No	No	-	-	
15	Premature end of test	No	No	No	No	-	-	
16	Final occurrence of burning at the specimen [1] ..... min	10	10	10	10	-	-	
	Time of eventually end of test [1] ..... min:s	./.	./.	./.	./.			

[1] Indication of time: from the beginning of testing procedure
- Not tested
. /. Not occurred
*) No cause for complaint

Test results "Brandschachtprüfung" (part 2)								
line no.		Measured values specimen						require-ments
		E	F	G	H	-	-	
	Afterflame after end of test	No	No	No	No	-	-	
17	Time ..... min:s							
18	Number of specimen							
19	Front side of specimen							
20	Back side of specimen							
21	Flame length ..... cm							
	Afterglow after end of test	No	No	No	No	-	-	
22	Time ..... min:s							
23	Number of specimen							
	Place of appearance:							
24	Lower half of specimen							
25	Upper half of specimen							
26	Front side of specimen							
27	Back side of specimen							
	Smoke density							
28	≤ 400 % min	23,9	20,8	16,5	18,5	-	-	
29	≥ 400 % min (very strong smoke density)	./.	./.	./.	./.	-	-	
30	Diagram fig. no.	10	12	14	16	-	-	
	Residual length							
31	Individual value ..... cm	40	38	38	38	-	-	
		40	39	37	38	-	-	
		38	40	38	37	-	-	> 0
		38	36	38	39	-	-	
32	Average value ..... cm	**39**	**38**	**37**	**38**	-	-	≥ 15
33	Photo of the test specimen fig. no.	9	11	13	15	-	-	
	Flue gas temperature							
34	Maximum of average	115	117	113	111	-	-	≤ 200
35		9:16	9:56	10:00	9:52	-	-	
36		10	12	14	16	-	-	
37	Remarks: - - (diagrams and photos see enclosures)							

Specimen	Test-No.	Type name	Orientation	Substrate
E	600316-005	solvoprint easy dot clear	longitudinal	aluminium sheet
F	600316-006		transversal	
G	600316-007		longitudinal	aluminium sheet
H	600316-008		transversal	

1) indication of time: from the beginning of testing procedure
- not tested
. /. not occurred
*) no cause for complaint

5 Assessment

Section 4.2 lists the test results of the composite which is described in section 1 and compares the results with the requirements for not easily flammable building materials acc. DIN 4102-1. According to the test results the self-adhesive plastic foils, used 1-sided, fulfil the requirements of building materials class B1 according to DIN 4102-1 if used on one side onto metal surfaces:
- with a density ≥ 2025 kg/m^3, a melting point ≥ 500 °C and a thickness ≥ 0,8 mm
- with a density ≥ 5890 kg/m^3, a melting point ≥ 1000 °C and a thickness ≥ 0,6 mm

and if the composite is mounted in a distance of > 40 mm to the same or other plain materials.

The requirements of building materials class B2 are also fulfilled, no falling of burning parts or droplets occurred during these tests.

The verification for outdoor usage (ageing behaviour by outdoor weathering) has not been proved.

6 Special remarks

This report is only valid for the material as described under paragraph 1. In combination with other materials or with additional coatings or surfaces etc. the burning behaviour may differ.

This test report is not valid, as soon as the product is used as a building product in the sense of the "Landesbauordnungen" (state building requirements, MBO § 17, par. 3).
This test report is no substitute for a General Building Inspectorate Certificate. This test report is granted without prejudice to the rights of third parties, or particular private proprietary rights.

In General Building Inspectorates procedures this test report can be based for
- regular building materials for the required proof of accordance
- for not regular building materials for the required proof of applicability

The explanations given in DIN 4102-1 app. D, especially concerning an external production control has to be considered.

This test report is valid until 2021-11-30, provided that the test methods, the classification rules and the technology do not change during this period.

Borkheide, 14th of December 2016

Head of the test laboratory
Dipl.-Ing. Uwe Kühnast

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In charge for testing
Dipl.-Ing. Manfred Sailer

This translation was issued the 14th of December 2016, in a case of doubt the German version is valid solely.

Test specimen A

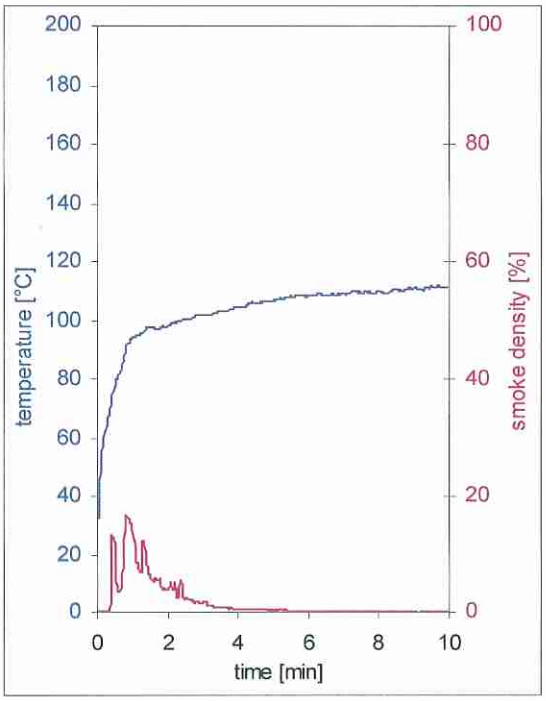

fig. 1
Graphs of the flue gas temperature and the smoke density

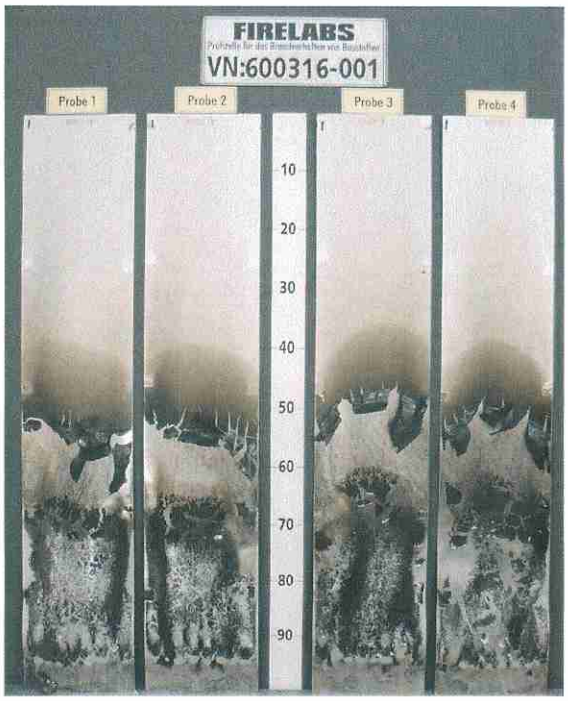

fig. 2
View of test specimen after the test

Test specimen B

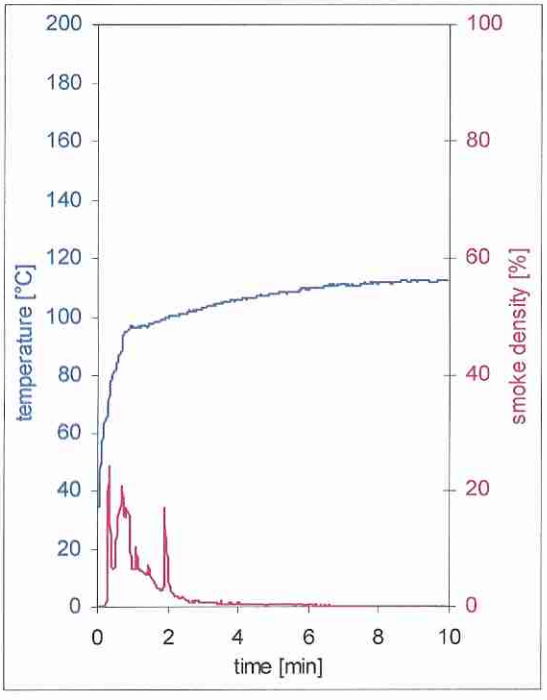

fig. 3
Graphs of the flue gas temperature and the smoke density

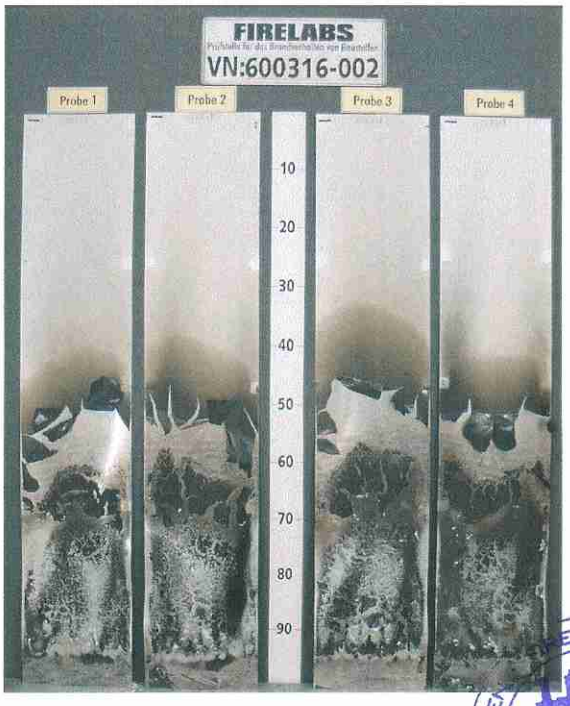

fig. 4
View of test specimen after the test

Test specimen C

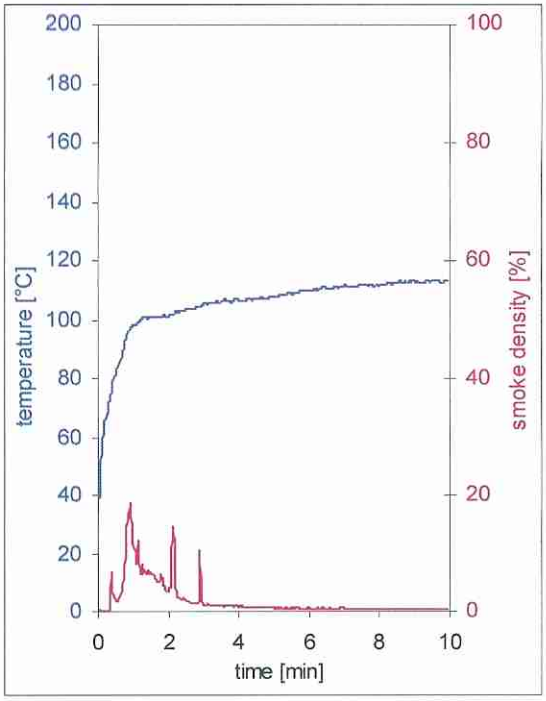

fig. 5
Graphs of the flue gas temperature and the smoke density

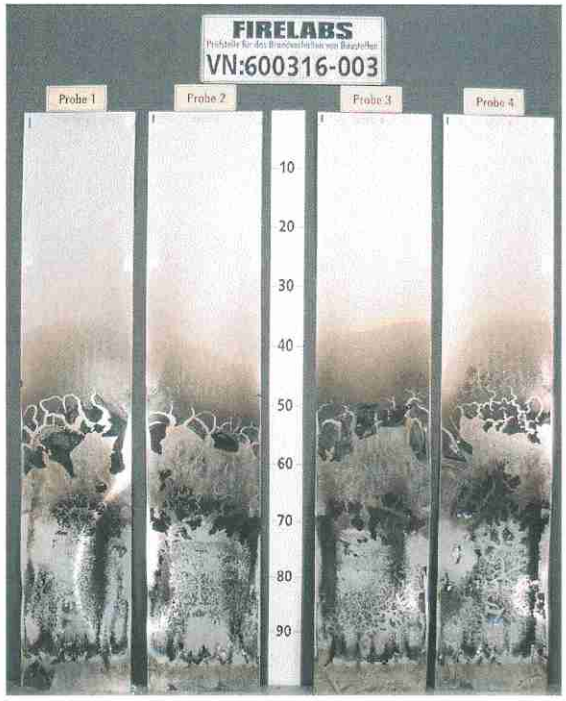

fig. 6
View of test specimen after the test

Test specimen D

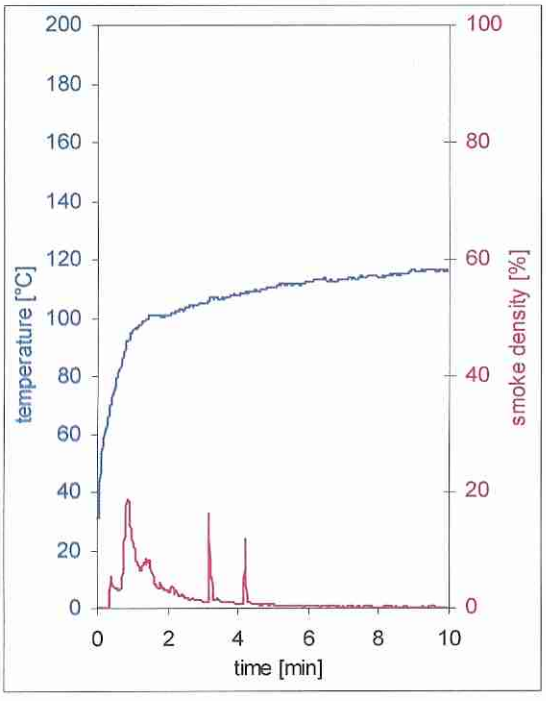

fig. 7
Graphs of the flue gas temperature and the smoke density

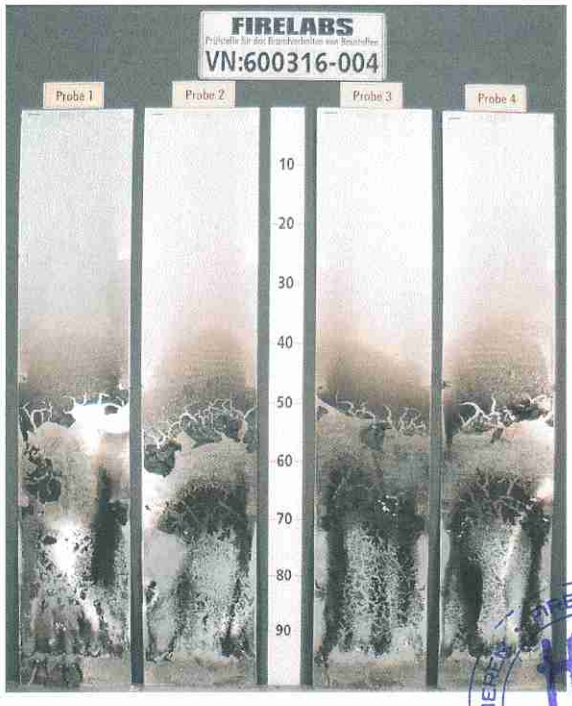

fig. 8
View of test specimen after the test

Test specimen E

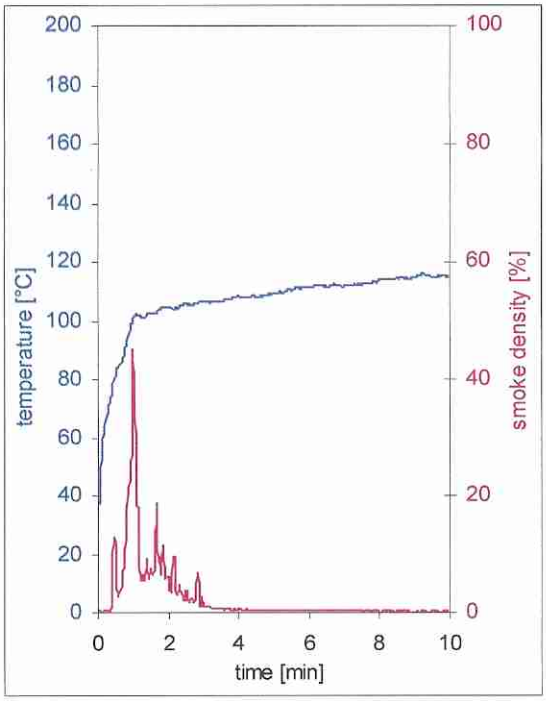

fig. 9
Graphs of the flue gas temperature and the smoke density

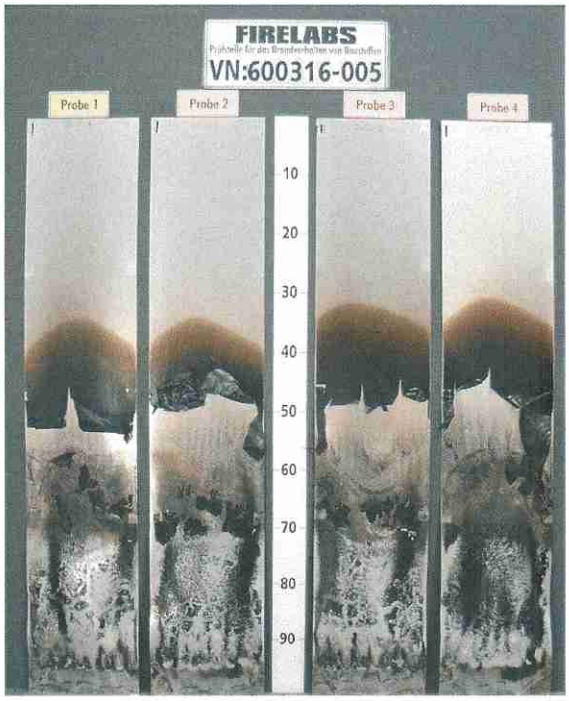

fig. 10
View of test specimen after the test

Test specimen F

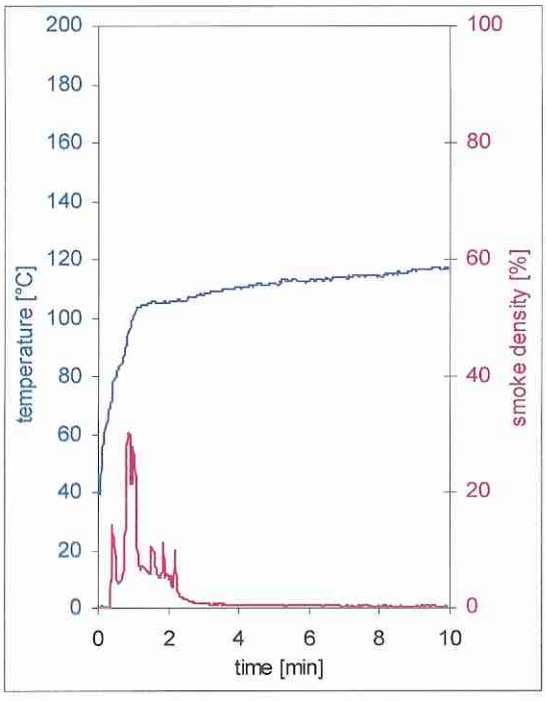

fig. 11
Graphs of the flue gas temperature and the smoke density

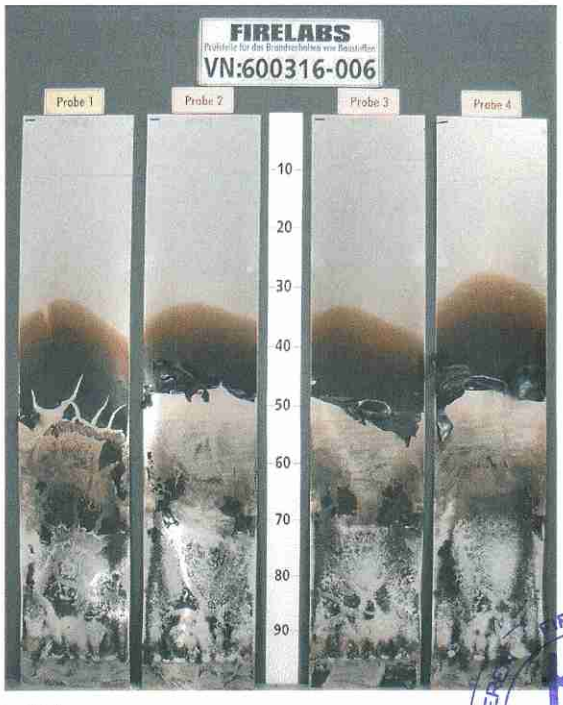

fig. 12
View of test specimen after the test

Test specimen G

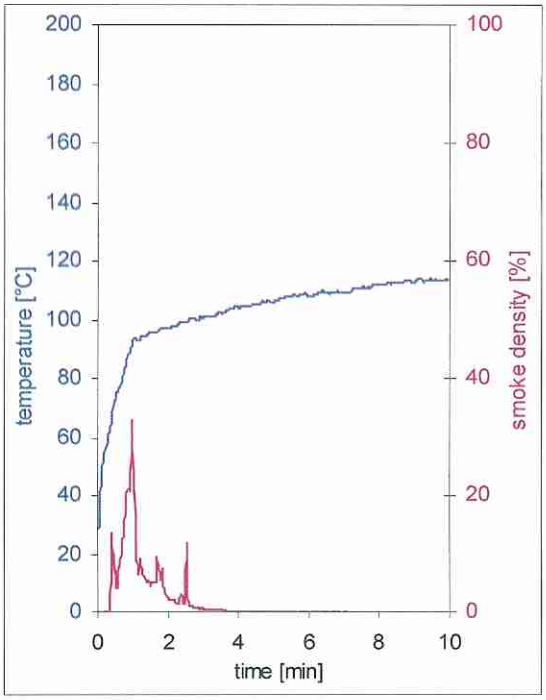

fig. 13
Graphs of the flue gas temperature and the smoke density

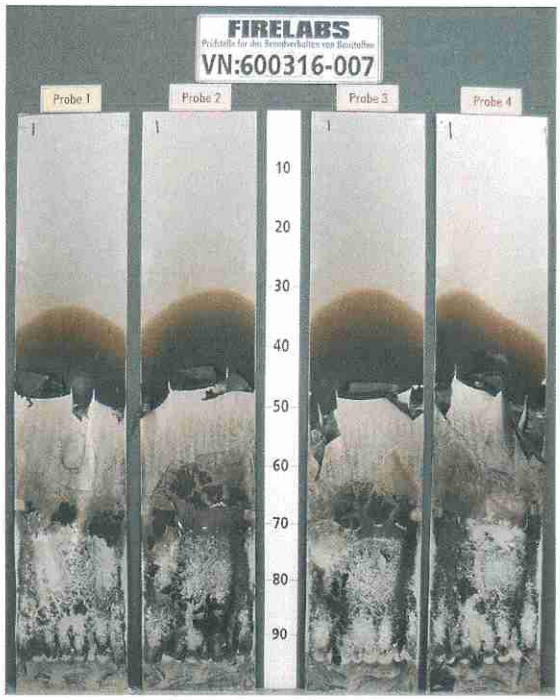

fig. 14
View of test specimen after the test

Test specimen H

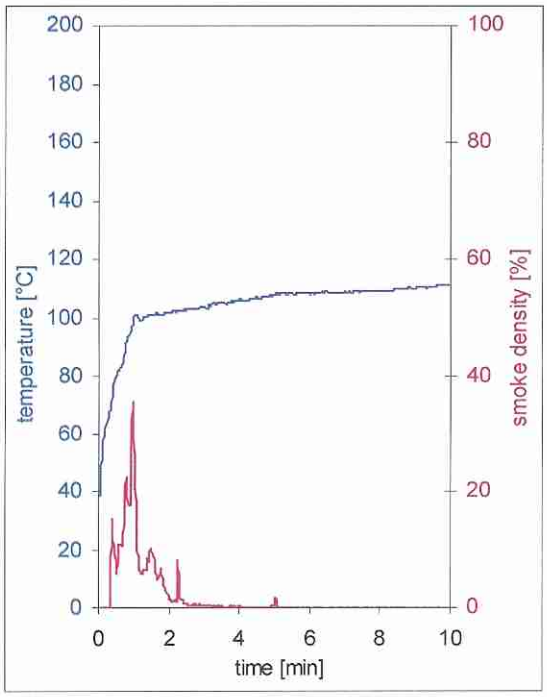

fig. 15
Graphs of the flue gas temperature and the smoke density

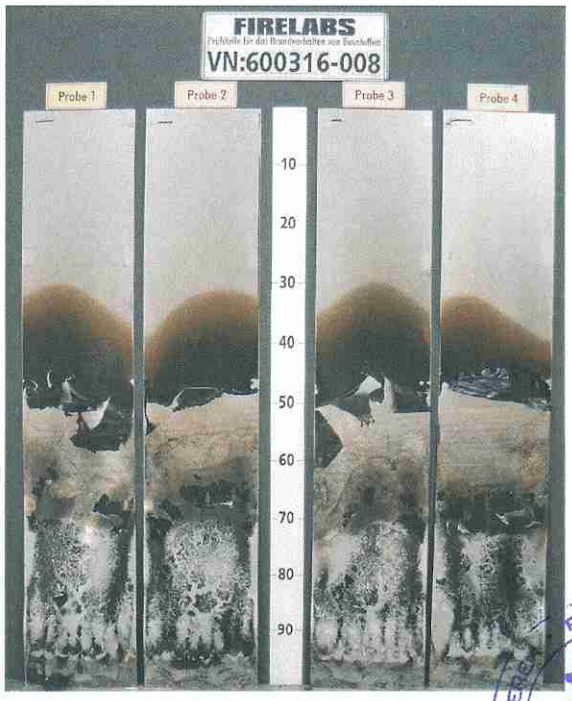

fig. 16
View of test specimen after the test

Test results small burner test

Table 2.1

solvoprint easy dot matt	longitudinal direction							transversal direction							dim.	require-ments
Sample-No.	1	2	3	4	5	6	-	1	2	3	4	5	6	-	-	-
Ignition of the sample	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Maximum flame height	0	0	0	0	0	0	-	0	0	0	0	0	0	-	cm	-
Time of the maximum	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Flame tip reached the 150 mm mark	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	≥ 20
Flame has extinguished	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Ignition of filter paper	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	[1]
Smoke density (visual)	very low							very low							-	-
Afterburning time	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Flames were extinguished after	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
View of the samples after the test (20 seconds after exposure the flame): The samples were not destroyed at the area of the flame application.																

Samples 1-5: Edge flame exposure
Samples 6: Surface flame impingement

Table 2.2

solvoprint easy dot glossy	longitudinal direction							transversal direction							dim.	require-ments
Sample-No.	1	2	3	4	5	6	-	1	2	3	4	5	6	-	-	-
Ignition of the sample	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Maximum flame height	0	0	0	0	0	0	-	0	0	0	0	0	0	-	cm	-
Time of the maximum	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Flame tip reached the 150 mm mark	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	≥ 20
Flame has extinguished	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Ignition of filter paper	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	[1]
Smoke density (visual)	very low							very low							-	-
Afterburning time	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Flames were extinguished after	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
View of the samples after the test (20 seconds after exposure the flame): The samples were not destroyed at the area of the flame application.																

Samples 1-5: Edge flame exposure
Samples 6: Surface flame impingement

[1] No ignition within 20 seconds
./. Not occurred
dim. Dimension
Indication of time: from the beginning of testing procedure
Indication of measurements: from reference line of the flame

Table 2.3

solvoprint easy dot clear	longitudinal direction							transversal direction							dim.	require-ments
Sample-No.	1	2	3	4	5	6	-	1	2	3	4	5	6	-	-	-
Ignition of the sample	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Maximum flame height	0	0	0	0	0	0	-	0	0	0	0	0	0	-	cm	-
Time of the maximum	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Flame tip reached the 150 mm mark	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	≥ 20
Flame has extinguished	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Ignition of filter paper	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	[1]
Smoke density (visual)	very low							very low							-	-
Afterburning time	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
Flames were extinguished after	./.	./.	./.	./.	./.	./.	-	./.	./.	./.	./.	./.	./.	-	s	-
View of the samples after the test (20 seconds after exposure the flame): The samples were not destroyed at the area of the flame application.																

Samples 1-5: Edge flame exposure
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[1] No ignition within 20 seconds
./. Not occurred
dim. Dimension
Indication of time: from the beginning of testing procedure
Indication of measurements: from reference line of the flame