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

FIRE LABS
Prüfstelle für das Brandverhalten von Baustoffen
Dipl.-Ing. Uwe Kühnast

Steinstrasse 18
D - 14822 Borkheide
Fon: +49 33845 90901
Fax: +49 33845 90909
Mail: info@firelabs.de

PÜZ-Stelle (LBO): BRA09

Reference: FLT 3635117 (Translation of the German Prüfzeugnis - no guarantee for translation of technical terms)

Sponsor: REGULUS GmbH
Paul-Gossen-Str. 114
D – 91011 Erlangen

Order: 2017-09-11 **Arrived:** 2017-09-11

Description of samples: On one side coated film made of rigid PVC, named "**SI 412**".
(for details see page 2)

Delivered: 2017-09-14

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

Assessment: The examined material meets the requirements of class B1 for "schwerentflammbare" (not easily flammable) building materials according to DIN 4102-1 if used in one layer, suspended freely or with distance of >40 mm to the same or other plain materials.
(for details see page 5)

Validity: 2022-09-30

Sampling: The samples were 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 certificate.
This test certificate is not valid if the examined building material is used as product in the meaning of state building prescriptions (MBO § 17).

This test certificate 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 certificate 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.

TEST CERTIFICATE

This test certificate replaces the test certificate FLT 3635117 dated 17.10.2017.
The sample material has not been retested.

This test certificate comprises 5 pages and 4 appendices.

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1 Description of test material

1.1 Test material (according to the sponsor)

The delivered material is a rigid PVC-film coated on one side with a microporous and printable coating (designated as Inkjet-coating) with a nominal thickness of 350 µm. The coated film is intended to be used indoor as advertising space or for decorative purposes and was named with the trade names "SI 412" by the sponsor.

1.2 Description of the delivered samples

For the tests the laboratory received a sample roll of a plastic film with a coated surface on one side. The sample had a length of approx 20 m and a width of 1.07 m. The sample was marked with batch CHE 17030/I17.
Colour of the film: white
Colour of the coating: white

Characteristic values: see passage 4.1; photos: see enclosures 1-4
Further details are not known to the laboratory; a retain sample each has been deposited.

2 Preparation of samples

For the small burner tests ("Brennkastenprüfungen") samples for edge flame exposure (dimensions 190 mm x 90 mm) and samples for surface flame exposure (dimensions 230 mm x 90 mm) were cut in longitudinal and transverse direction of the films.

For the tests in the fire shaft ("Brandschacht") 6 specimens were assembled. The samples (dimensions 1000 mm x 190 mm) for test specimens A, B and E have been cut in longitudinal direction, the samples for test specimens C, D and F in transverse direction of the films.

All samples were kept in a climate chamber acc. DIN 50014-23/50-2 until they reached constant weight before testing.

3 Arrangement of samples

The small burner tests ("Brennkastenprüfungen") have been performed acc. DIN 4102-1, chapter 6.2.5 (building materials class B2). The tests in the fire shaft ("Brandschacht") have been performed acc. DIN 4102-1 and -16 (building materials class B1).

Arrangement of the samples: single layer, freely suspended

Period of testing: October 2017

4 Results

- section 4.1 Material characteristics
- section 4.2.1 Test results class B2
- section 4.2.2 Test results class B1

4.1 Material characteristics

Table 1

Trade name	Manufacturer's data		Measured values		
	Weight per unit area [g/m²]	Thickness [mm]	Weight per unit area [g/m²]	Thickness (m.v.) [mm]	[mm]
SI 412	490 - 500	0.35	516	0.35	0.004

m.v. mean value
s standard deviation
./. not received/not measured

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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 class B2; the material did not show burning particles/droplets during these tests.
(Results: see enclosure 4, table 2)

4.2.2 Test results class B1 ("Brandschacht")

Table 3

Test results "Brandschachtprüfung" (part 1)								
line no.		Test results						require-ments
		A	B	C	D	E	F	
1	Number of specimen arrangement acc. DIN 4102 –15 Table 1	1	1	1	1	1	1	
2	Maximal flame height above bottom edge ..... cm	60	50	50	50	60	50	*)
3	Time [1] ..... min	2	1	2	2	1	1	
4	Burning / melting through Time [1] ..... min	1	1	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	No	No	
8	Extend: Sporadic falling of burning droplets							
9	Continuous falling of burning droplets							
10	Falling of burning parts Begin [1] ..... min	Yes 1	Yes 1	Yes 1	Yes 1	Yes 1	Yes 1	
11	Extend: Sporadic falling of burning parts	Yes	Yes	Yes	Yes	Yes	Yes	
12	Continuous falling of burning parts	No	No	No	No	No	No	
13	Afterflame time at the bottom of the sieve (max.) ..... min:s	0:04	0:07	0:17	0:13	0:11	0:06	
14	Impairment of the burner flames by dropping or falling Material Time [1] ..... min:s	No	No	No	No	No	No	
15	Premature end of test Final occurrence of burning at							
16	the specimen [1] ..... min	2	10	3	3	4	3	
	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	E	F	
	Afterflame after end of test	No	No	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	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	71.2	71.2	66.5	68.2	69.5	81.1	
29	≥ 400 % min (very strong smoke density)	./.	./.	./.	./.	./.	./.	
30	Diagram fig. no.	2	4	6	8	10	12	
	Residual length							
31	Individual value ..... cm	32 38 48 34	52 48 53 55	55 60 48 56	52 47 52 48	39 37 43 39	52 49 58 52	> 0
32	Average value ..... cm	**38**	**52**	**54**	**49**	**39**	**52**	≥ 15
33	Photo of the test specimen fig. no.	2	4	6	8	10	12	
	Flue gas temperature							
34	Maximum of average	115	113	117	113	115	118	≤ 200
35		9:48	10:00	9:42	9:54	9:58	10:00	
36		1	3	5	7	9	11	
37	Remarks: line 13: Afterflame time at the bottom of the sieve < 20 sec. is not rated as "falling of burning parts or droplets" line 32: There were no additional tests proceeded based on the residual length of the samples tested on the uncoated surface of > 45 cm (DIN 4102-16, 5.2 b)) (Diagrams and photos see enclosure 1-3)							

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

Test specimen	Test-no.	Trade name	Direction of samples	Tested surface
A	635117-001	SI 412	longitudinal	coated
B	635117-002			uncoated
C	635117-003		transverse	coated
D	635117-004			uncoated
E	635117-010		longitudinal	coated
F	635117-011		transverse	

5 Assessment

According to the test results in section 4.2 the material, described in section 1 and 4.1, fulfils the requirements of a building material class B1 according to DIN 4102-1, if the material is used suspended freely or with a distance of > 40 mm to the same or other plain materials.

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

The verification

- for outdoor usage (ageing behavior by outdoor weathering)

has not been proved.

6 Special remarks

This certificate 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 certificate 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).
This test certificate is no substitute for a General Building Inspectorate Certificate. This test certificate is granted without prejudice to the rights of third parties, or particular private proprietary rights.

In General Building Inspectorates procedures this test certificate can be based for

- regulated building materials for the required proof of accordance
- for non-regulated 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 certificate is valid until 2022-09-30, provided that the test methods, the classification rules and the technology do not change during this period.

Borkheide, 5th of July 2018

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

This translation was issued 5th of July 2018, in a case of doubt the German version is valid solely.

Test specimen A

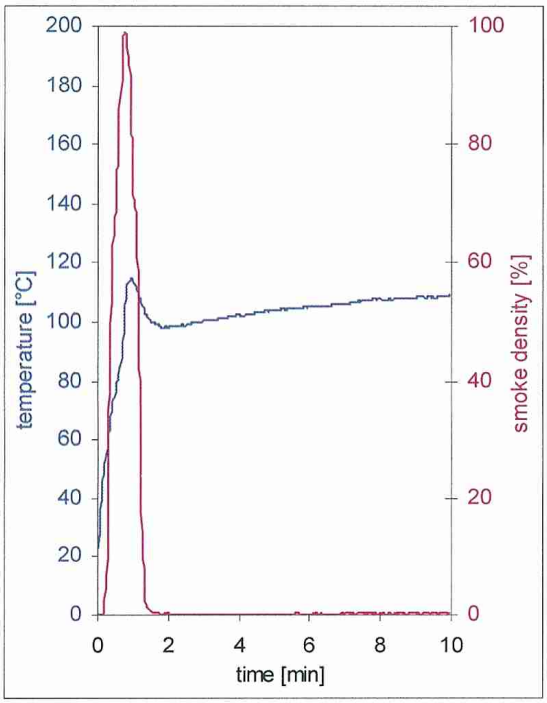

fig. 1
Graphs of the flue gas temperature and the smoke density

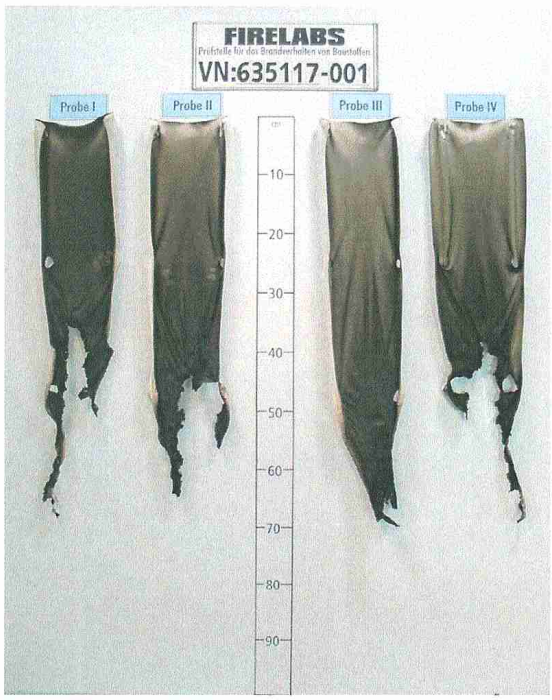

fig. 2
View of test specimen after the test

Test specimen B

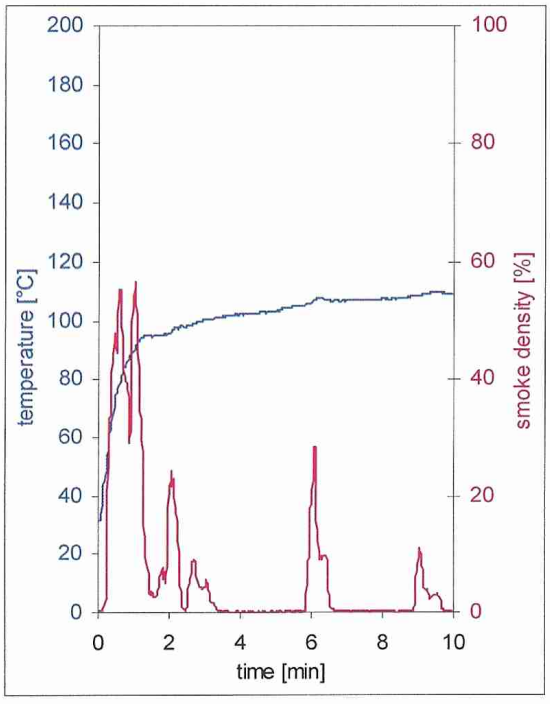

fig. 3
Graphs of the flue gas temperature and the smoke density

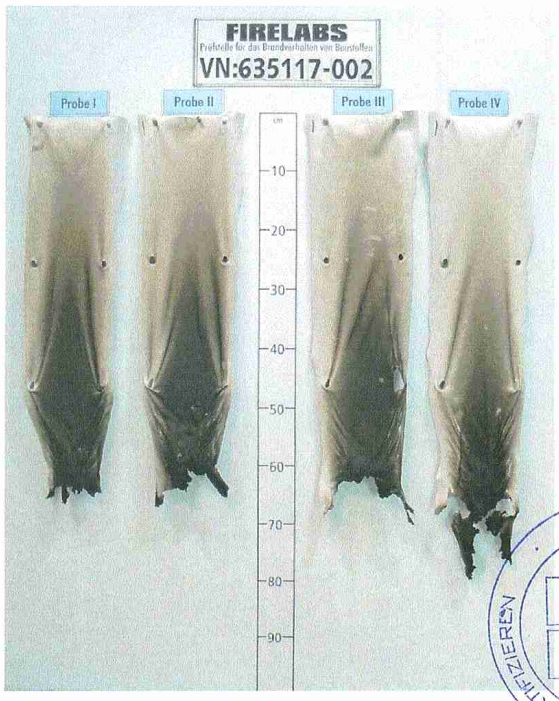

fig. 4
View of test specimen after the test

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Test specimen C

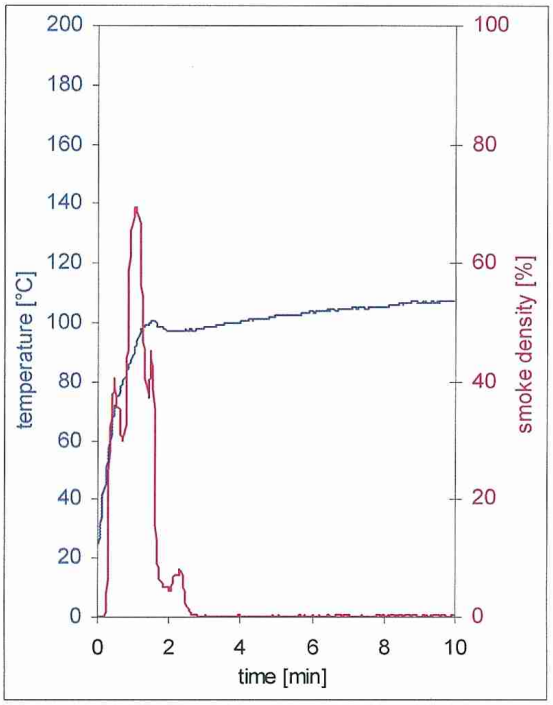

fig. 5
Graphs of the flue gas temperature and the smoke density

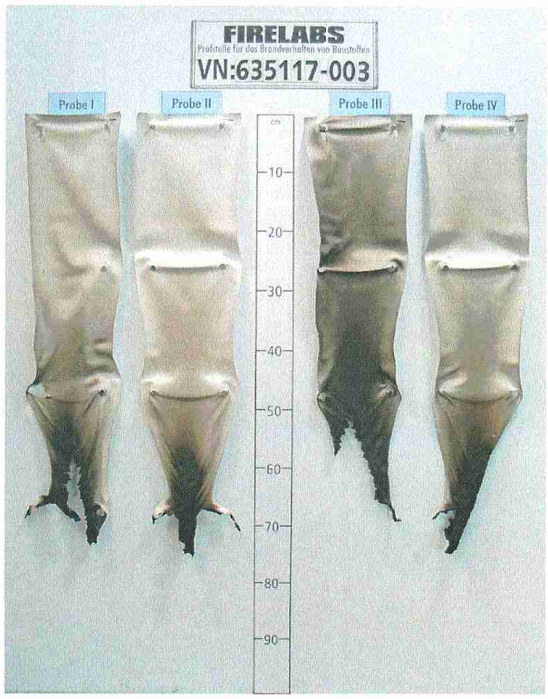

fig. 6
View of test specimen after the test

Test specimen D

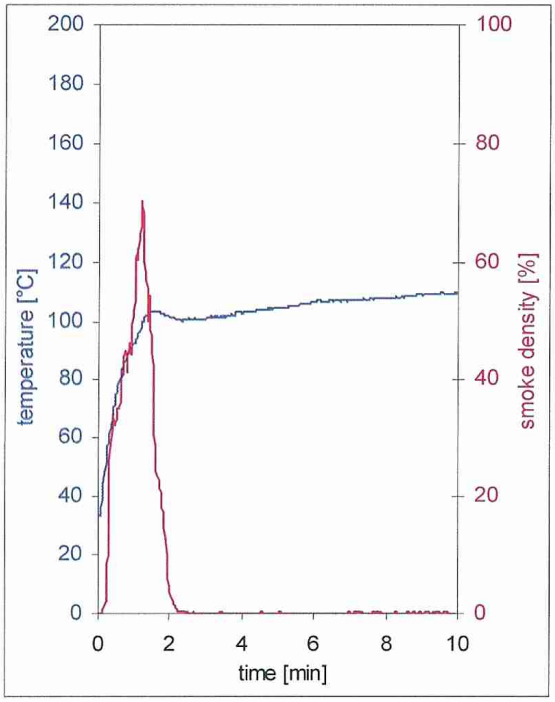

fig. 7
Graphs of the flue gas temperature and the smoke density

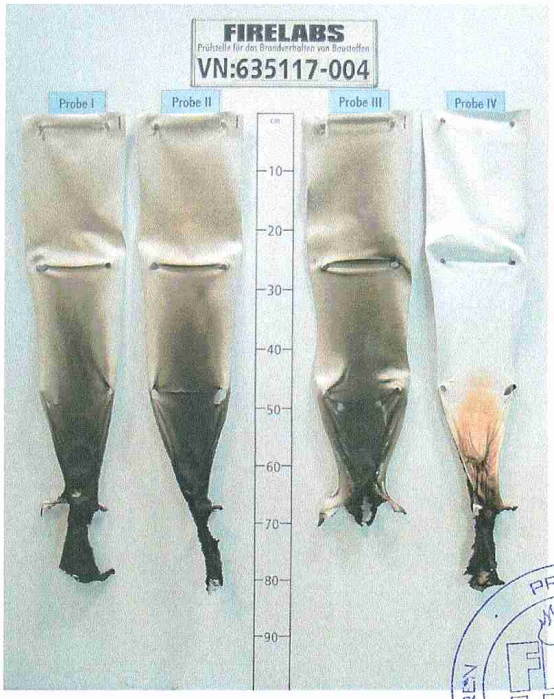

fig. 8
View of test specimen after the test (sample 4: reverse side)

Test specimen E

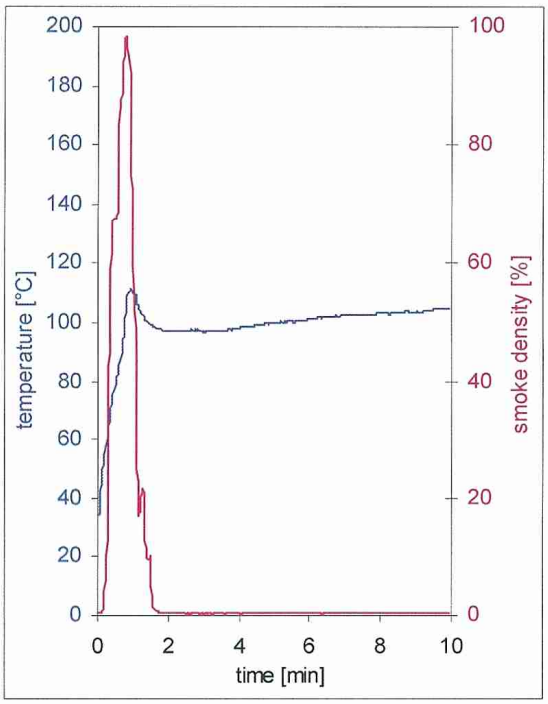

fig. 9
Graphs of the flue gas temperature and the smoke density

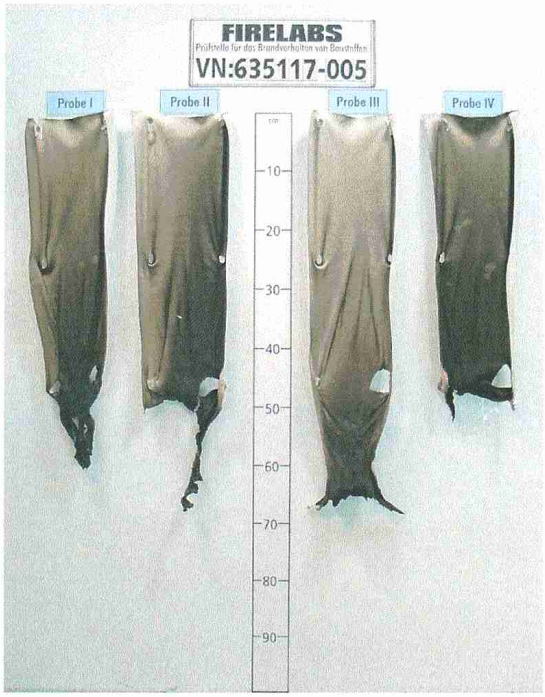

fig. 10
View of test specimen after the test

Test specimen F

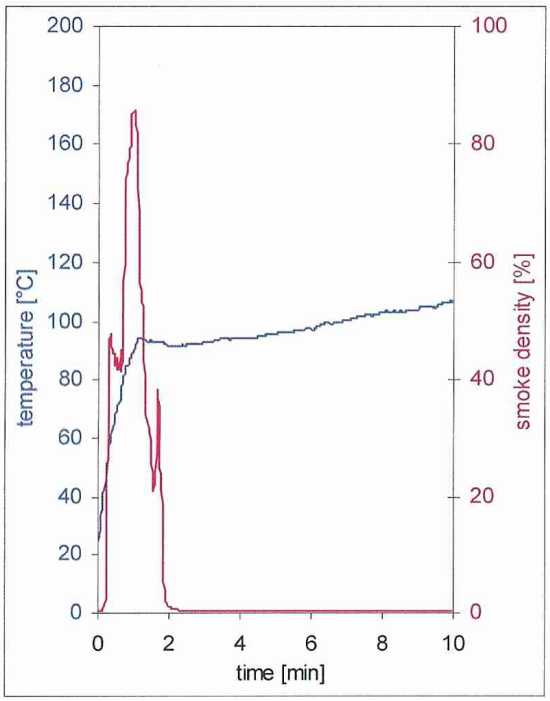

fig. 11
Graphs of the flue gas temperature and the smoke density

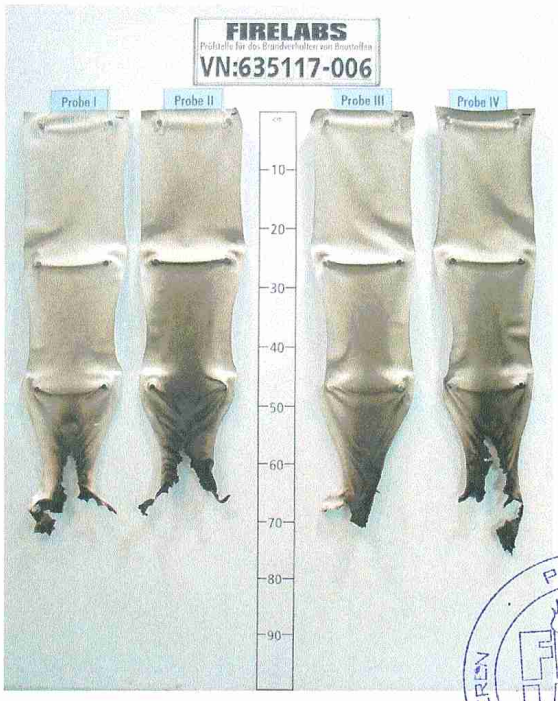

fig. 12
View of test specimen after the test

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Test results small burner ("Brennkasten") tests

Table 2

SI 412	Longitudinal direction							Transverse direction							dim.	require-ments
Sample-No.	1	2	3	4	5	6	7	1	2	3	4	5	6	7	n	-
Ignition of the sample	5	5	4	5	5	4	1	5	4	4	4	4	5	1	s	-
Maximum flame height	6	5	6	6	5	6	4	5	5	6	5	6	5	6	cm	-
Time of the maximum	10	9	10	10	12	13	10	9	10	10	12	13	9	15	s	-
Flame tip reached the 150 mm mark	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	s	≥ 20
Self-extinguishing of flames	16	16	16	16	16	16	19	16	16	16	16	16	16	20	s	-
Ignition of filter paper	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	s	[1]
Smoke density (visual)	moderate							moderate							-	-
Afterburning time	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	s	-
Flames were extinguished after	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	s	-
View of the samples after the test (20 seconds after exposure the flame): The samples were destroyed in the area of the flame exposure up to a max height of approx 7 cm and approx 1.5 cm in width, soot above until top edge of the samples.																

Samples 1-5: surface flame exposure of coated surface
Samples 6: surface flame exposure of uncoated surface
Samples 7: edge flame exposure

[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

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