

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



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Brandverhalten
von Baustoffen
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PÜZ-Stelle (LBO): BRA09

Reference: FLT 3771722 (Translation of the German test report - no guarantee for translation of technical terms)

Client: Regulus Coating GmbH
Paul-Gossen-Str. 114
D – 91011 Erlangen

Order: 2022-01-31 **Arrived:** 2022-02-09

Description of sample: Self-adhesive, colour-coated plastic film, to be used on metallic surfaces, named "SIVC".
(for details see page 2)

Delivered: 2022-02-09

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

Assessment: The examined material meet the requirements of class B1 for "schwerentflammbare" (not easily flammable) building materials according to DIN 4102-1 on metal substrates and if the compound is used suspended freely or with distance if >40 mm to the same or other plain materials.
(For details see page 5.)

Validity of report: 2027-02-28

Sampling: The test material was provided by the client itself

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 regarded as the sole proof if the tested building material is used as building product within 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.

This test report comprises 5 pages and 2 enclosures.

Approved testing, inspection and certification body

This test report must not be published and copied preceding agreement of the test laboratory and if agreed, only during validity and unchanged concerning appearance and contents. Agreement of the test laboratory has to be given in any case if norms in which the tests are based or other technical standards have changed.

TEST CERTIFICATE



1 Test material

1.1 Description according to the client

The delivered material is a 0.13 mm thick film made of PVC with a one-sided microporous and printable colour coating and an adhesive application on the reverse side. The adhesive was protected with a siliconized paper. The self-adhesive film is intended to be used indoor, applied on metallic surfaces and was named "SIVC" by the client.

1.2 Description of the delivered samples

For the tests the laboratory received a sample roll of a white plastic film with white coating and self-adhesive backing as well as a siliconized protective paper applied on the rear side. The sample roll had a length of about 20 m and a width of 1.07 m.

Colour: white film, white coating, white paper liner.

Marking: CH142031902/A22

Characteristic values: table 1; photos: see enclosures.

Other specifications are not known to the laboratory, a sample is stored.

2 Preparation of samples

For the small burner test ("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 transverse direction of the films and applied on one side onto uncoated aluminium sheets of a thickness of 1.0 mm.

For the tests in the fire shaft ("Brandschacht") 2 specimens were prepared. The samples (dimensions 1000 mm x 190 mm) of test specimens A were cut in longitudinal and the samples for the test specimens B in transverse orientation of the film and applied on one side to uncoated aluminium sheets of a thickness of 1.0 mm.

Afterwards all samples kept in a climate chamber acc. DIN 50014-23/50-2 until they reached constant weight.

3 Test procedure

The small burner tests have been performed acc. DIN 4102-1, chapter 6.2.5 (building materials class B2). The tests in the fire shaft have been performed acc. DIN 4102-1 and -16 (building materials class B1). There was no additional substrate arranged behind the material compound. Test period: February 2022.

4 Results

- section 4.1 Material characteristics
- section 4.2.1 Test results class B2 (small burner test)
- section 4.2.2 Test results class B1 (fire shaft)

4.1 Material characteristics

Table 1

Layer	Manufacturer's data		Measured values (m.v.)		
	Thickness [mm]	Mass per area unit [g/m ²]	Thickness [mm] (m.v.)	s	Mass per area unit [g/m ²]
SIVC *)	./.	./.	0.15	< 0.003	169
Paper liner	./.	./.	0.14	0.004	133
SIVC with paper liner	0.30	280	0.29	0.004	303

m.v. mean value

s standard deviation

./. not received/not measured

*) with adhesive layer, without paper liner



4.2 Results of the fire behaviour

4.2.1 Test results class B2 (Brennkasten)

According DIN 4102-1 all building materials class B1 must also meet the requirements of materials class B2 (low flammable). The material, tested in "Brennkasten" acc. DIN 50 050 meets the requirements class B2; the material did not show burning particles / droplets (Results: see enclosure 2).

4.2.2 Test results class B1 (Brandschacht)

Table 3

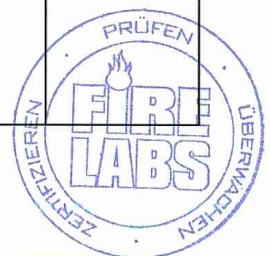
Test results "Brandschachtprüfung" (part 1)						
line no.	Measurement	Test results				requirements
		A	B	C	D	
1	<u>Number of specimen arrangement</u> acc. DIN 4102 –15 Table 1	7	7	-	-	
2	<u>Maximal flame height</u> above bottom edge cm	60	60	-	-	*)
3	Time ¹⁾ min	1	1	-	-	
4	<u>Burning / melting through</u> Time ¹⁾min	./.	./.	-	-	
5	<u>Back side of the specimens:</u> <u>Flames / glowing</u> Time ¹⁾min	./.	./.	-	-	
6	<u>Discolouring</u> Time ¹⁾min	3	3	-	-	
7	<u>Falling of burning droplets</u> Begin ¹⁾min:s	No	No	-	-	
8	Extend: Sporadic falling of burning droplets					
9	Continuous falling of burning droplets					
10	<u>Falling of burning parts</u> Begin ¹⁾min:s	No	No	-	-	
11	Extend: Sporadic falling of burning parts					
12	Continuous falling of burning parts					
13	<u>Afterflame time at the bottom of</u> <u>thesieve (max.)</u>min:s	./.	./.	-	-	
14	<u>Impairment of the burner</u> <u>flames by dropping or falling</u> <u>Material</u> Time ¹⁾min:s	No	No	-	-	
15	<u>Premature end of test</u> Final occurrence of burning at the specimen ¹⁾min	No	No	-	-	
16	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.	Measurement	Test results				requirements
		A	B	C	D	
17	<u>Afterflame after end of test</u>	No	No	-	-	
18	Timemin:s					
19	Number of specimen					
20	Front side of specimen					
21	Back side of specimen					
21	Flame lengthcm					
22	<u>Afterglow after end of test</u>	No	No	-	-	
23	Timemin:s					
24	Number of specimen					
25	<u>Place of appearance:</u>					
26	Lower half of specimen					
27	Upper half of specimen					
28	Front side of specimen					
29	Back side of specimen					
30	<u>Smoke density</u>					
31	≤ 400 % min	21,2	18,8	-	-	
32	≥ 400 % min (very strong smoke density)	./.	./.			
33	Diagram fig. no.	1	3			
34	<u>Residual length</u>					
35	Individual valuecm	50	51	-	-	> 0
36		46	51	-	-	
37		49	53	-	-	
38		52	52	-	-	
39	Average valuecm	49	51	-	-	≥ 15
40	Photo of the test specimen fig. no.	2	4			
41	<u>Flue gas temperature</u>					
42	Maximum of average value...°C	118	116	-	-	≤ 200
43	Time ¹⁾min:s	9:36	9:12	-	-	
44	Diagram fig. no.	1	3			
45	<u>Remarks:</u> line 32: Due to the residual length of the samples of ≥ 45 cm no additional tests were proceeded (DIN 4102-16: 2015-09, 5.2 b)). Diagrams and photos see enclosure 1.					

1) indication of time: from the beginning of testing procedure

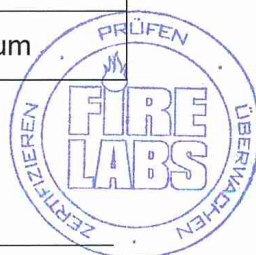
- not tested

./.. not occurred

*) no cause for complaint

VN test-number

Specimen	Test-No.	Trade name	Orientation of self-adhesive film	Substrate
A	771422-001	SIVC	longitudinal	Aluminium
B	771422-002		transversal	



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 film, fulfil the requirements of building materials class B1 according to DIN 4102-1, if used on one side onto metal surfaces with a:

- density $\geq 2025 \text{ kg/m}^3$, melting point $\geq 500 \text{ °C}$ and thickness $\geq 0,8 \text{ mm}$
- density $\geq 5890 \text{ kg/m}^3$, melting point $\geq 1000 \text{ °C}$ and thickness $\geq 0,6 \text{ mm}$

and if the composite is mounted in a distance of $> 40 \text{ mm}$ 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 certificate is only valid for the material as described under paragraph 1 and 4.1. In combination with other materials or additional coatings or surfaces etc. the burning behaviour may differ.

This test certificate is not regarded as the sole proof if the tested building material is used as building product within the meaning of state building prescriptions (MBO § 17).

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

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.

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

This test certificate is valid until 2027-02-28, provided that the test methods, the classification rules and the technology do not change during this period.

Borkheide, 1st of March 2022



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

This translation was issued the 1st of March 2022, in a case of doubt the German version is valid solely.

Test specimen A

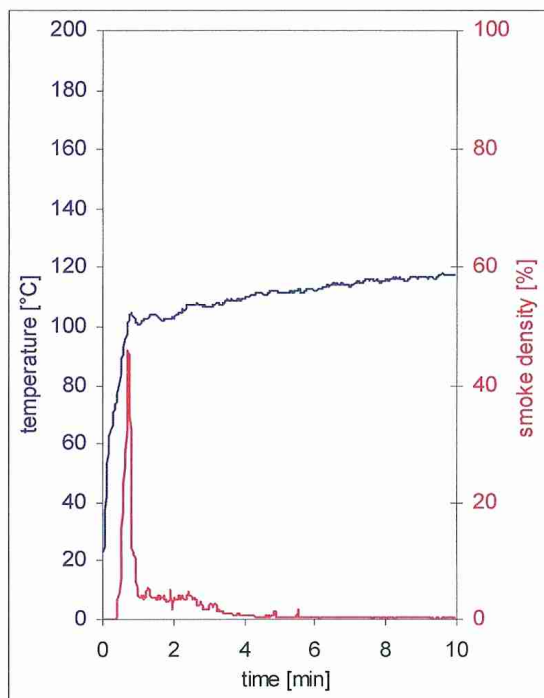


fig. 1
Graphs of the flue gas temperature and the smoke density

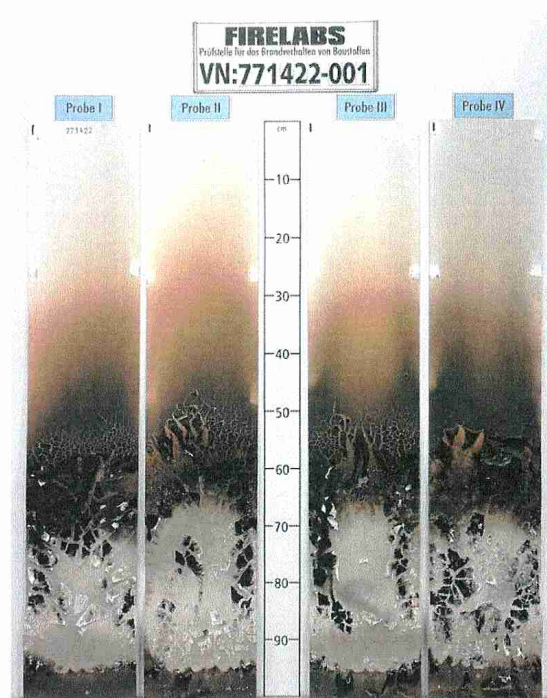


fig. 2
Photo of the test specimen after the test

Test specimen B

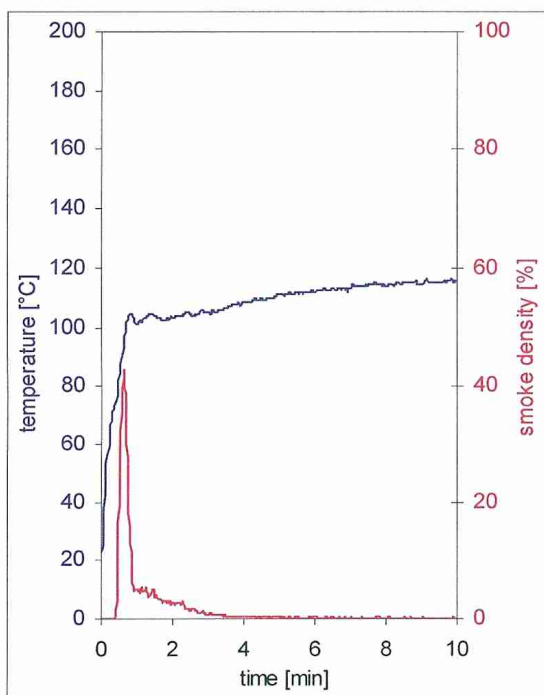


fig. 3
Graphs of the flue gas temperature and the smoke density

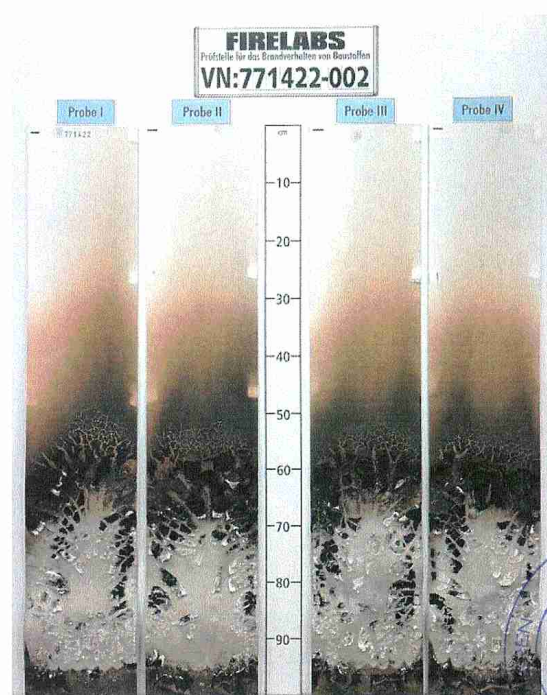


fig. 4
Photo of the test specimen after the test



Test results small burner test

Table 2

	longitudinal						transversal						dim.	requirements
Sample-No.	1	2	3	4	5	6	1	2	3	4	5	6	-	-
Ignition of the sample	1	./.	./.	1	1	./.	./.	./.	1	1	1	./.	s	-
Maximum flame height	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	cm	-
Time of the maximum	15	./.	./.	15	15	./.	./.	./.	15	15	15	./.	-	-
Flame tip has reached the 150 mm mark	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	s	≥ 20
Flames extinguished	16	16	16	16	16	./.	16	16	16	16	16	./.	s	-
Ignition of filter paper	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	s	1)
Smoke density (visual)	very low						very low						-	./.
Afterburning time	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	./.	s	-

View of the samples after the test (20 seconds after exposure the flame):

The specimens were superficially destroyed in the area of the flame impingement point up to a height of about 0.3 cm and a width of about 1 cm, above discoloured brown about 1 cm.

Samples 1-5: edge flame exposure

Samples 6: surface 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

