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

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| | |
|---|---|
| **Reference** | FLT 3231609 (Translation of the German test report - no guarantee for translation of technical terms) |
| **Company** | Georg + Otto Friedrich Wirkwarenfabrik KG<br>Waldstrasse 73<br>D - 64846 Groß-Zimmern |
| **Order** | 2009-01-16 **Arrived** 2009-01-16 |
| **Description of samples** | White polyester knit fabric to use as flag fabric, as decoration or for exhibition stand constructions, named as:<br>**"Fahnenstoffe (90-130g/m²) mit flammhemmender Ausrüstung für den Transferdruck"**<br>(for details see page 2) |
| **Delivered** | 2009-03-19 |
| **Content of request** | Proof of flammability to classify building materials to class B1 "schwerentflammbar" according to DIN 4102-1 |
| **Assessment** | The examined product meets the requirements of class B1 for "schwerentflammbare" (hardly 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.<br>(for details see page 5) |
| **Validity of test report** | 2014-04-30 |
| **Sampling** | by the company itself |

TEST REPORT

Remark: If the above-mentioned building material is not used as product according to MBO § 2, Abs. 9, Ziffer 1, 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, Abs. 3).

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 Prufzeugnis (general building inspectorate certificate) or by
- "Zustimmung im Einzelfall (exceptional approval)

This test report can underlie building supervisory procedures:

- for regular building products for the prescribed proofs of conformity
- for non-regular building products for the needed proofs of applicability.

This test report includes 5 pages and 3 enclosures.

Approved testing, inspection and certification body

## 1 Description of test material (according to the manufacturer)

Polyester knit fabrics with a non-permanent flame-retardant treatment and a pre-treatment for transfer printing.
The material is intended to be used indoor as flag fabric, as decoration or for exhibition stand constructions (also printable by transfer printing) and was labelled with the trade name:
**"Fahnenstoffe (90-130g/m²) mit flammhemmender Ausrüstung für den Transferdruck"**

For the tests the laboratory received the following plain articles (lowest and highest mass per unit area) by the manufacturer:

article '6155FL': Partie- / VA-Nr. 46049; length 5m x width 1,56m
article '6659FL': Partie- / VA-Nr. 46398; length 2,5m x width 3,05m
(characteristic values: see table 1, photos: see enclosure 1-2)

## 2 Preparation of samples

Out of the material the following samples have been cut and kept in a climate chamber acc. DIN 50014-23/50-2 until they reached constant weight:

Brandschacht-test: 2 specimens, made of 4 samples with the dimensions 1000 mm x 190 mm were assembled of each article. The samples for the test specimens A and C were cut in machine direction, the samples for the test specimens B and D were cut in cross machine direction

Brennkasten (small burner) test: 5 samples for edge exposure (dimensions 190 mm x 90 mm) and 1 sample for surface exposure (dimensions 230 mm x 90 mm) were cut from each article in machine and cross machine direction.

## 3 Test procedure

The tests have been performed acc. DIN 4102-1, chapter 6.2.4.2 (building materials class B2) and DIN 4102-1 and -16 (building materials class B1).

Arrangement of all samples: freely suspended

Examination period: May 2009

## 4 Results

Table 1 Material characteristics
Table 2 Test results class B2, see table 2.1, 2.2
Table 3 Test results class B1

### 4.1 Material characteristics

Table 1

| Name / type | Specifications by manufacturer | | Measured values | |
|---|---|---|---|---|
| | mass per unit ($g/m^2$) | thickness (mm) | mass per unit ($g/m^2$) | thickness (mm) |
| Artikel '6155FL' | 90 ± 5,0 | ./. | 97,4 | 0,29 ±0,002 |
| Artikel '6659FL' | 130 ± 4,0 | ./. | 124,0 | 0,28 ±0,005 |

./. not received/not measured

### 4.2 Results of the fire behaviour

#### 4.2.1 Test results class B2 (small burner test)

Acc. to DIN 4102 all building materials class B1 must also meet the requirements of materials class B2. The material meets the requirements class B2; the material does not show burning particles / droplets.

results: see enclosure 3

### 4.2.2 Test results class B1 ("Brandschacht")

Table 3.1

| Test results (part 1) | | | | | | |
|---|---|---|---|---|---|---|
| line no. | Measurement | Test results | | | | Require-ments |
| | Test specimen | A | B | C | D | |
| 1 | Number of specimen arrangement acc. DIN 4102 –15 Table 1 | 1 | 1 | 1 | 1 | |
| 2 | Maximal flame height above bottom edge ..... cm | 30 | 30 | 30 | 30 | |
| 3 | Time [1] ..... min | 1 | 1 | 1 | 1 | *) |
| 4 | Burning / melting through Time [1] .....min | 1 | 1 | 1 | 1 | |
| | Back side of the specimens: | | | | | |
| 5 | Flames / glowing Time [1] .....min:s | ./. | ./. | ./. | ./. | |
| 6 | Discolouring Time [1] .....min:s | ./. | ./. | ./. | ./. | |
| | Falling of burning droplets | no | no | no | no | |
| 7 | Begin [1].....min:s | - | - | - | - | |
| | Extend: | | | | | |
| 8 | Sporadic falling of burning droplets | - | - | - | - | |
| 9 | Continuous falling of burning droplets | | | | | |
| | Falling of burning parts | no | no | no | no | |
| 10 | Begin [1].....min:s | - | - | - | - | |
| | Extend: | | | | | |
| 11 | Sporadic falling of burning parts | - | - | - | - | |
| 12 | Continuous falling of burning parts | | | | | |
| 13 | Afterflame time at the bottom of the sieve (max.). min:s | ./. | ./. | ./. | ./. | |
| | Impairment of the burner flames by dropping or falling Material | | | | | |
| 14 | Time [1] .....min:s | no | no | no | no | |
| | Premature end of test | no | no | no | no | |
| 15 | Final occurrence of burning at the specimen [1].....min:s | 1:40 | 1:50 | 1:10 | 1:30 | |
| 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 (part 2) | | | | | | |
|---|---|---|---|---|---|---|
| line no. | Measurement | Test results | | | | Require-ments |
| | Test specimen | A | B | C | D | |
| 17 | Afterflame after end of test<br>Time .....min:s | no | no | no | no | |
| 18 | Number of specimen | | | | | |
| 19 | Front side of specimen | | | | | |
| 20 | Back side of specimen | | | | | |
| 21 | Flame length .....cm | | | | | |
| 22 | Afterglow after end of test<br>Time .....min:s | Nein | Nein | Nein | Nein | |
| 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 | 0,6 | 0,2 | 1,3 | 0,6 | |
| 29 | ≥ 400 % min (very strong smoke density) | | | | | |
| 30 | Diagram fig. no. | 1 | 3 | 5 | 7 | |
| 31 | Residual length<br>Individual value .....cm | 68<br>67<br>68<br>64 | 66<br>59<br>62<br>65 | 63<br>68<br>63<br>64 | 65<br>64<br>67<br>65 | > 0 |
| 32 | Average value .....cm | **66** | **63** | **64** | **65** | ≥15 |
| 33 | Photo of test specimen fig. no. | 2 | 4 | 6 | 8 | |
| 34 | Flue gas temperature<br>Maximum of average value...°C | 122 | 123 | 122 | 122 | ≤ 200 |
| 35 | Time [1] .....min:s | 9:30 | 9:44 | 9:52 | 9:18 | |
| 36 | Diagram fig. no. | 1 | 3 | 5 | 7 | |
| 37 | Remarks: Line 32 – There were no additional tests proceeded, because of the residual length of more then 45 cm | | | | | |

Test specimen A: article '6155FL' samples in machine direction; VN 231609-001
Test specimen B: article '6155FL' samples in cross machine direction; VN 231609-002
Test specimen C: article '6659FL' samples in machine direction; VN 231909-001
Test specimen D: article '6659FL' samples in cross machine direction; VN 231909-002

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

## 5 Assessment

According to the test results in section 4.2 the material, described in section 1, named: **"Fahnenstoffe (90-130g/m²) mit flammhemmender Ausrüstung für den Transferdruck"** with an area weight of 90 - 130g/m² fulfils the requirements of building materials 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 material also meets the requirements of building materials class B2; the material does not show burning particles/droplets.

This test report is not valid for

- the exposure to outdoor climate conditions
- washing or cleaning with chemicals
- dyed or printed material.

## 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 grounds 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 valid until 2014-04-30, assuming that the test methods, the classification rules and the technology do not change during this period.

Borkheide, 18th of May 2009

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

Test specimen A

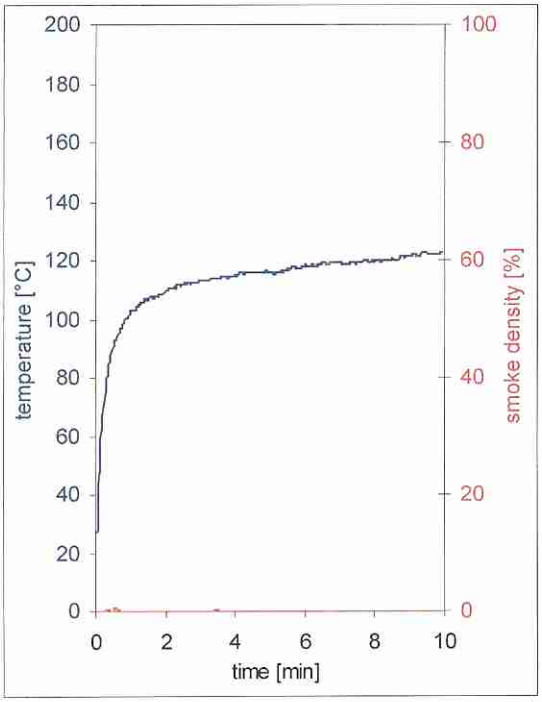


fig. 1
Graph of the flue gas temperature and the smoke density

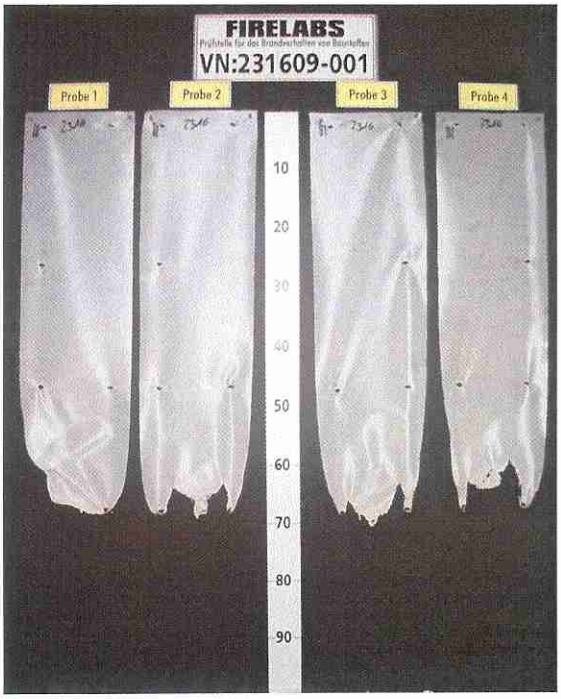


fig. 2
Photo of the test specimen after the test

Test specimen B

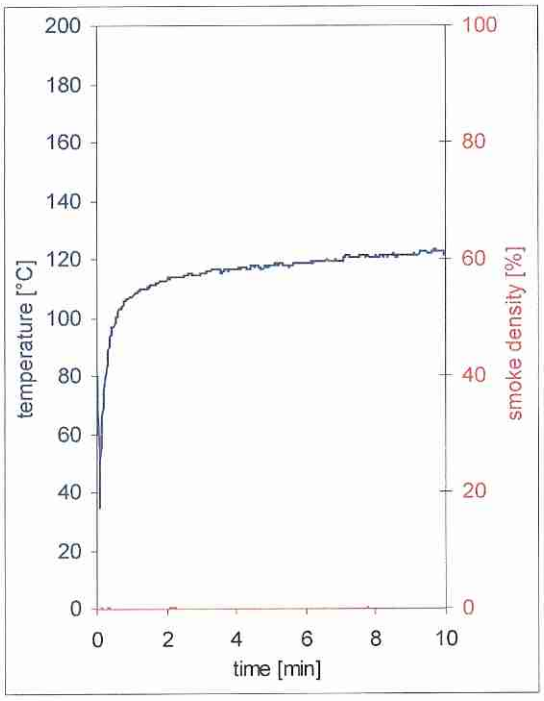


fig. 3
Graph of the flue gas temperature and the smoke density

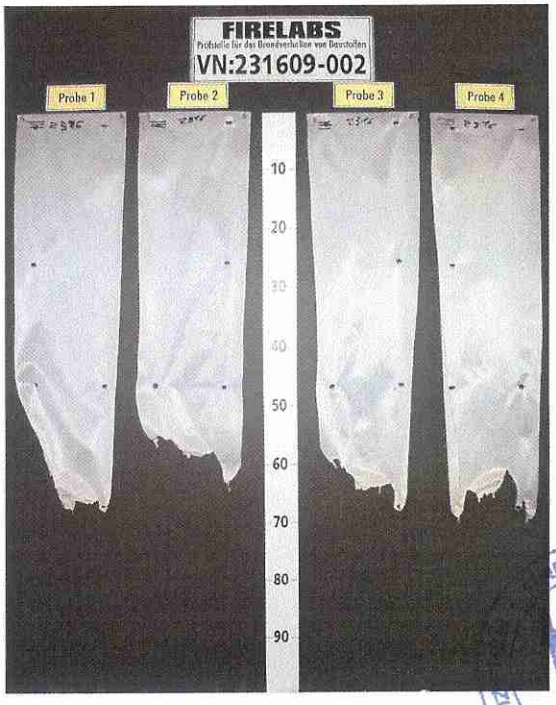


fig. 4
Photo of the test specimen after the test

Test specimen C

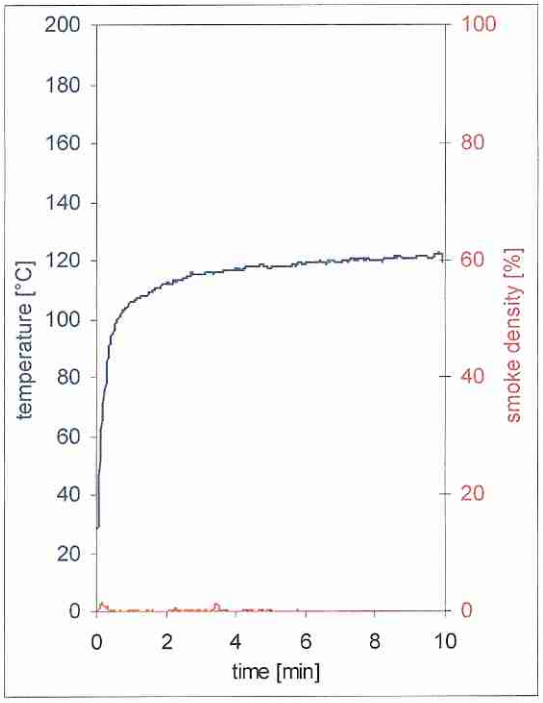


fig. 5
Graph of the flue gas temperature and the smoke density

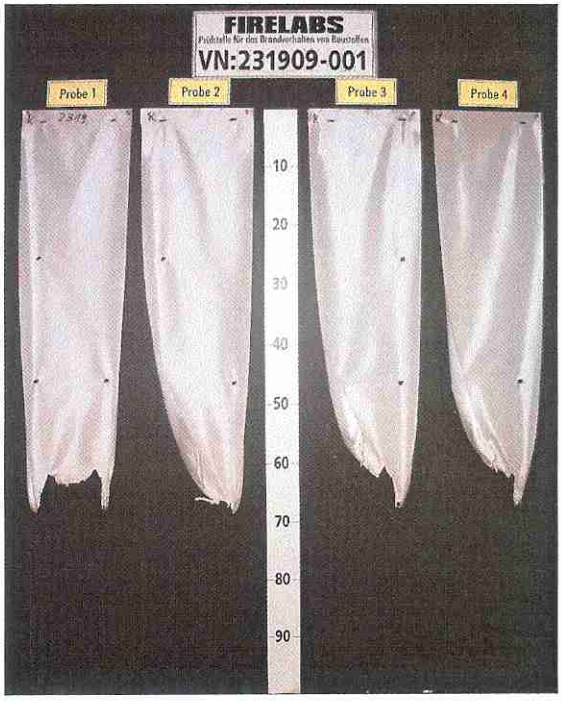


fig. 6
Photo of the test specimen after the test

Test specimen D

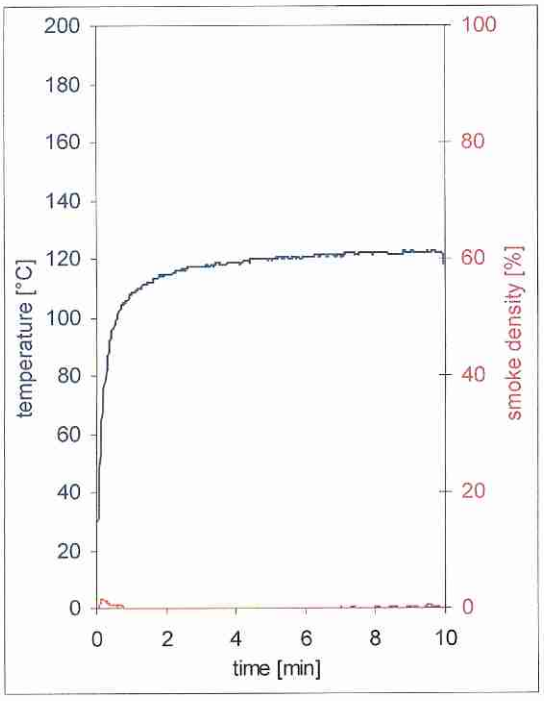


fig. 7
Graph of the flue gas temperature and the smoke density

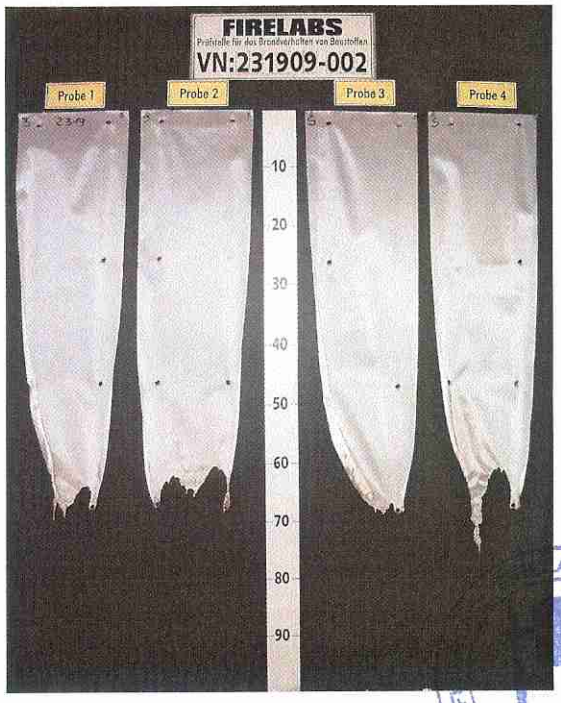


fig. 8
Photo of the test specimen after the test

Table 2.1 – article '6155FL'

| | MD | | | | | | CMD | | | | | | dim. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | - |
| Ignition of the sample | 1 | 1 | 1 | 1 | 1 | 1 | ./. | 1 | ./. | 1 | ./: | ./. | s |
| Maximum flame height | 3 | 3 | 3 | 4 | 3 | 2 | 0 | 1 | 0 | 1 | 0 | 0 | cm |
| Time of the maximum | 5 | 5 | 4 | 5 | 4 | 6 | ./. | 2 | ./. | 3 | ./. | ./. | s |
| Flame tip reached the 150 mm test mark | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s |
| Flame has extinguished before reaching the test mark | 6 | 5 | 4 | 5 | 4 | 6 | 0 | 2 | 0 | 3 | 0 | 0 | s |
| Ignition of filter paper | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s |
| Smoke density (visually) | very low | | | | | | very low | | | | | | |
| Afterburning time | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s |
| View of the samples (MD and CMD) after the test (20 seconds after exposure the flame): burned/melted length: app. 12 cm; burned/melted width: app. 2 cm | | | | | | | | | | | | | |

Table 2.2 – article '6659FL'

| | MD | | | | | | CMD | | | | | | dim. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 | 4 | 5 | 6 | - |
| Ignition of the sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | s |
| Maximum flame height | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 4 | 3 | 3 | 2 | 3 | cm |
| Time of the maximum | 4 | 5 | 3 | 4 | 4 | 4 | 2 | 3 | 3 | 4 | 3 | 4 | s |
| Flame tip reached the 150 mm test mark | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s |
| Flame has extinguished before reaching the test mark | 4 | 6 | 3 | 5 | 4 | 5 | 2 | 4 | 3 | 4 | 4 | 5 | s |
| Ignition of filter paper | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s |
| Smoke density (visually) | very low | | | | | | very low | | | | | | |
| Afterburning time | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s |
| View of the samples (MD and CMD) after the test (20 seconds after exposure the flame): burned/melted length: app. 10 cm; burned/melted width: app. 2 cm | | | | | | | | | | | | | |

./. Not occurred
dim. Dimension
indication of time: from the beginning of testing procedure
indication of measurements: from reference line of the flame
samples 1-5: edge exposure
samples 6: surface exposure
MD: machine direction / CMD: cross machine direction