

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

| | |
|-------------------------------|---|
| Reference | FLT 3460813 (Translation of the German test report - no guarantee for translation of technical terms) |
| Sponsor | PONGS Technical Textiles GmbH Bahnhofstr. 21 D - 07919 Pausa-Mühltruff |
| Order | 2013-07-09 Arrived 2013-07-16 |
| Description of samples | Uncoated knitted fabrics made of polyester with a flame retardant treatment, named: "DirectTex® Flag 110", "DirectTex® Poplin Plus", "DirectTex® Softimage Creaseless" and "DirectTex® Softimage 240" (for details see page 2) |
| Delivered | 2013-07-16 |
| Content of request | Proof of flammability to classify building materials to class B1 "schwerentflammbar" according to DIN 4102-1 |
| Assessment | The examined products 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 of >40 mm to the same or other plain materials. (for details see page 5) |
| Validity of report | 2018-07-31 |
| Sampling | by the company itself |

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 Prüfzeugnis (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 pre scribed proofs of conformity
- for non-regular building products for the needed proofs of applicability.

This test report comprises 5 pages and 4 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This test report must not be published and copied preceding agreement of the test laboratory and if agreed, only during validity and unchanged concerning appearance and contents.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.

¹ 89/106/EEC

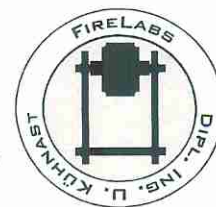


Prüfstelle für das
Brandverhalten
von Baustoffen
Dipl.-Ing. Uwe Kühnast

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

PÜZ-Stelle (LBO): BRA09

TEST REPORT



1 Description of test material in condition as delivered

1.1 Test material (according to the sponsor)

The delivered materials are four knitted fabrics made of polyester with a flame retardant treatment and weights per square meter from 118 g/m² - 240 g/m². The knitted fabrics are intended to be used inside of buildings as printable media or for decorative purposes and were marked with the trade names: "DirectTex[®] Flag 110", "DirectTex[®] Poplin Plus", "DirectTex[®] Softimage Creaseless" and "DirectTex[®] Softimage 240".

1.2 Description of the delivered material

For the tests the laboratory was provided with 4 samples of uncoated knitted fabrics made of synthetic yarn. The knitted fabrics were labelled with article-no. and piece-no. and were labelled with the corresponding trade names.

The following samples have been sent to the laboratory:

| Trade name | Article-no. | Treatment-no. | Piece-no. | Length [m] | Width [m] |
|---|-------------|---------------|--------------|------------|-----------|
| DirectTex [®] Flag 110 | 599 110 | 129 | 26574/03/028 | 5,20 | 1,54 |
| DirectTex [®] Poplin Plus | 599 200 | 129 | 26598/02/023 | 5,0 | 1,55 |
| DirectTex [®] Softimage Creaseless | 599 220 | 129 | 26637/02/043 | 5,0 | 1,55 |
| DirectTex [®] Softimage 240 | 599 250 | 129 | B18536/0/044 | 5,0 | 1,55 |

Colour: white, without printing;

characteristic values: see paragraph 4.1; Photos: see enclosures.

Other specifications are not known to the laboratory, a sample of each product 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 in transversal direction of each material.

For the fire shaft test ("Brandschachtprüfung") 4 specimens were assembled. The samples (dimensions 1000 mm x 190 mm) for the test specimens A and C were cut in longitudinal direction, the samples for the test specimen B and D were cut in transversal direction of the materials. (Assignments: refer to page 4)

3 Arrangement of samples

The tests in the fire shaft ("Brandschacht") have been performed acc. DIN 4102-1 and -16 (building materials class B1), samples with lowest and highest weight per square meter have been tested. The small burner tests ("Brennkastenprüfungen") have been performed acc. DIN 4102-1, chapter 6.2.5 (building materials class B2), these test have been executed on all delivered samples.

Arrangement of all samples: single layered, freely suspended.

Examination period: October 2013

4 Results

- section 4.1 Material characteristics
- section 4.2.1 Test results class B2 ("Brennkasten"), see enclosure 3
- section 4.2.2 Test results class B1 ("Brandschacht")

4.1 Material characteristics

Table 1

| Trade name | Manufacturer's data | | Measured values | | |
|---|---------------------|--------------------|-----------------|---------------------|--------------------|
| | Thickness | Mass per unit area | Thickness | | Mass per unit area |
| | | | m.v. | s | |
| [mm] | [g/m ²] | [mm] | [mm] | [g/m ²] | |
| DirectTex [®] Flag 110 | 0,31 ± 5% | 118 ± 5% | 0,31 | < 0,01 | 119 |
| DirectTex [®] Poplin Plus | 0,37 ± 5% | 170 ± 5% | 0,37 | < 0,01 | 171 |
| DirectTex [®] Softimage Creaseless | 0,39 ± 5% | 195 ± 5% | 0,39 | 0,002 | 197 |
| DirectTex [®] Softimage 240 | 0,51 ± 5% | 240 ± 5% | 0,51 | 0,003 | 243 |

m.v. mean value

s standard deviation

./ not received/not measured



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 (low flammable). The materials, tested in "Brennkasten" acc. DIN 50 050, meets the requirements class B2; the materials did not show burning particles/droplets.

(Results see enclosures 3-4, tables 2.1 – 2.3)

4.2.2 Test results class B1 (Brandschacht)

Table 3

| Test results "Brandschachtprüfung" (part 1) | | | | | | | | |
|---|---|--------------|-----|-----|-----|---|---|--------------|
| line no. | | Test results | | | | | | requirements |
| | | A | B | C | D | E | F | |
| 1 | <u>Number of specimen arrangement</u> acc. DIN 4102 –15 Table 1 | 1 | 1 | 1 | 1 | - | - | |
| 2 | <u>Maximal flame height</u> above bottom edge cm | 30 | 30 | 30 | 30 | - | - | *) |
| 3 | Time ¹⁾ min | 1 | 1 | 1 | 1 | - | - | |
| 4 | <u>Burning / melting through</u> Time ¹⁾min | 1 | 1 | 1 | 1 | - | - | |
| 5 | <u>Back side of the specimens:</u> <u>Flames / glowing</u> Time ¹⁾min:s | ./. | ./. | ./. | ./. | - | - | |
| 6 | <u>Discolouring</u> Time ¹⁾min:s | ./. | ./. | ./. | ./. | - | - | |
| 7 | <u>Falling of burning droplets</u> Begin ¹⁾min | No | No | 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 | No | No | - | - | |
| 11 | Extend: Sporadic falling of burning parts | | | | | | | |
| 12 | Continuous falling of burning parts | | | | | | | |
| 13 | <u>Afterflame time at the bottom of the sieve (max.)</u> min:s | ./. | ./. | ./. | ./. | - | - | |
| 14 | <u>Impairment of the burner flames by dropping or falling</u> <u>Material</u> Time ¹⁾min:s | No | No | No | No | - | - | |
| 15 | <u>Premature end of test</u> Final occurrence of burning at the specimen ¹⁾min | No | No | 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

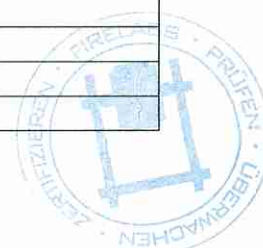
*) No cause for complaint



| Test results "Brandschachtprüfung" (part 2) | | | | | | | | |
|---|---|----------------------------|----------------------|----------------------|----------------------|------------------|------------------|--------------|
| line no. | | Messwerte Test specimen | | | | | | requirements |
| | | A | B | C | D | E | F | |
| 17 | <u>Afterflame after end of test</u> Timemin:s | No | No | No | No | - | - | |
| 18 | Number of specimen | | | | | | | |
| 19 | Front side of specimen | | | | | | | |
| 20 | Back side of specimen | | | | | | | |
| 21 | Flame lengthcm | | | | | | | |
| 22 | <u>Afterglow after end of test</u> Timemin:s | No | No | No | No | - | - | |
| 23 | Number of specimen | | | | | | | |
| 24 | <u>Place of appearance:</u> Lower half of specimen | | | | | | | |
| 25 | Upper half of specimen | | | | | | | |
| 26 | Front side of specimen | | | | | | | |
| 27 | Back side of specimen | | | | | | | |
| 28 | <u>Smoke density</u> ≤ 400 % min | 8,2 | 9,6 | 7,4 | 3,0 | - | - | |
| 29 | ≥ 400 % min (very strong smoke density) | | | | | | | |
| 30 | Diagram fig. no. | 1 | 3 | 5 | 7 | - | - | |
| 31 | <u>Residual length</u> Individual valuecm | 72 73 70 69 | 65 66 63 60 | 71 72 74 69 | 70 70 74 78 | - - - - | - - - - | > 0 |
| 32 | Average valuecm | 71 | 63 | 71 | 73 | - | - | ≥ 15 |
| 33 | Photo of the test specimen fig. no. | 2 | 4 | 6 | 8 | - | - | |
| 34 | <u>Flue gas temperature</u> Maximum of average value. °C | 115 | 115 | 117 | 119 | - | - | ≤ 200 |
| 35 | Time ¹⁾min:s | 9:52 | 9:46 | 9:56 | 9:56 | - | - | |
| 36 | Diagram fig. no. | 1 | 3 | 5 | 7 | - | - | |
| 37 | <u>Remark:</u> There were no additional tests proceeded, because of the residual length of more than 45 cm. (Graphs and photos: see enclosures 1, 2) | | | | | | | |

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

| Specimen | Type name | Test-no. | Direction of samples |
|----------|--------------------------|------------|----------------------|
| A | DirectTex® Flag 110 | 460813-001 | longitudinal |
| B | | 460813-002 | transversal |
| C | DirectTex® Softimage 240 | 460813-003 | longitudinal |
| D | | 460813-004 | transversal |



5 Assessment

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

The requirements of building materials class B2 were fulfilled also. Falling of burning parts or droplets did not occur during these tests.

This test report is not valid for

- the exposure to outdoor climate conditions
- washing or dry cleaning

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
- 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 2018-09-30, provided that the test methods, the classification rules and the technology do not change during this period.

Borkheide, 26th of October 2013



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



In charge for testing
(Dipl.-Ing. Manfred Sailer)

This translation was issued on the 24th of July 2014. In case of doubt, the German version is solely valid.

Test specimen A

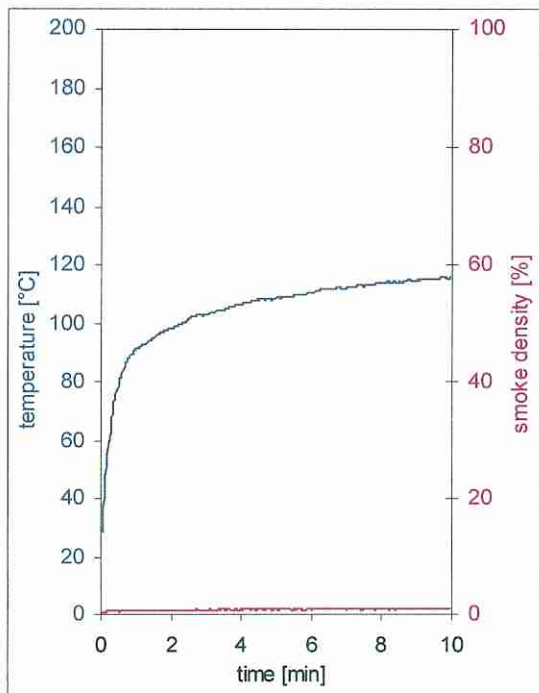


fig. 1
Graphs of the flue gas temperature and the smoke density

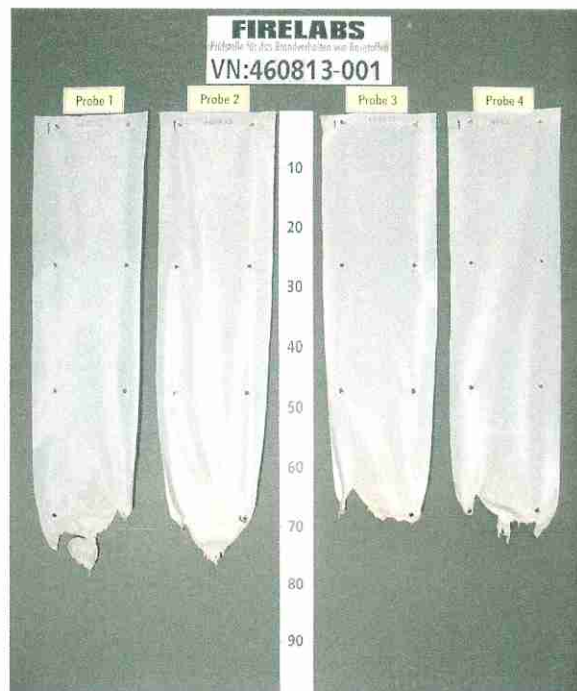


fig. 2
Photo of test specimen after the test

Test specimen B

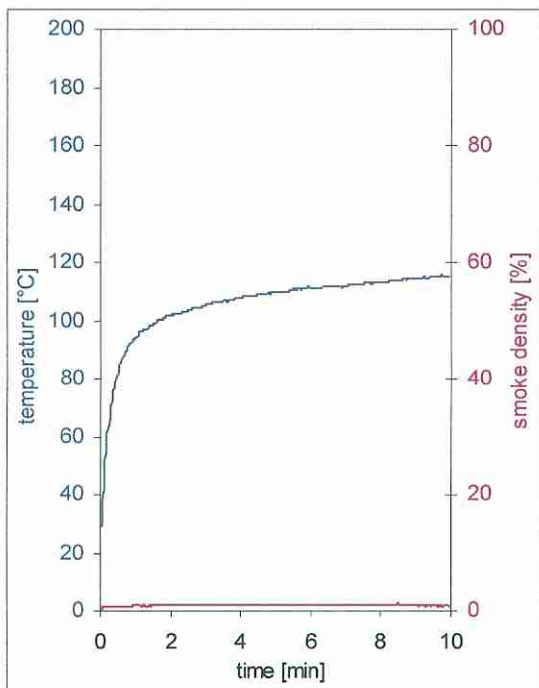


fig. 3
Graphs of the flue gas temperature and the smoke density

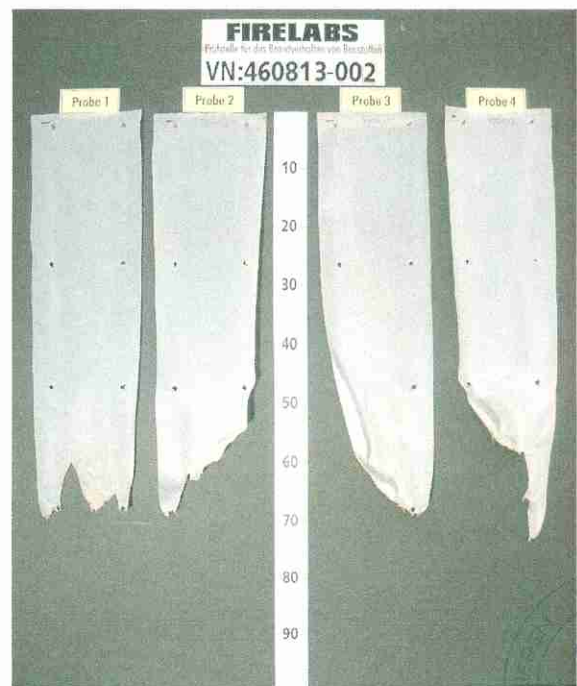


fig. 4
Photo of test specimen after the test



Test specimen C

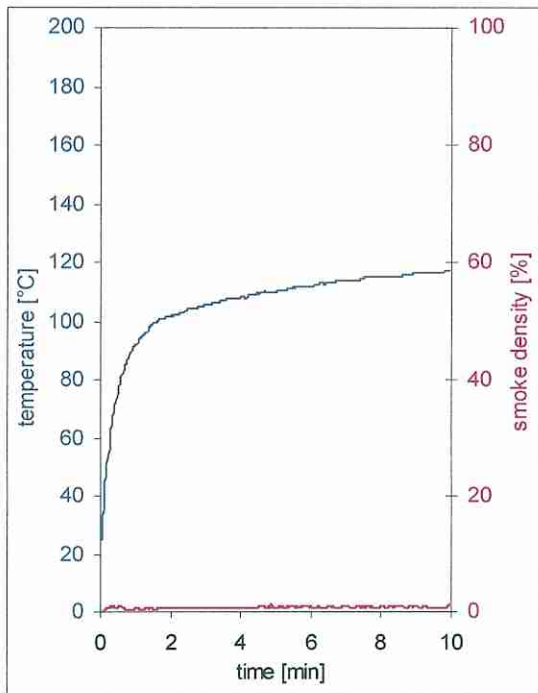


fig. 5
Graphs of the flue gas temperature and the smoke density

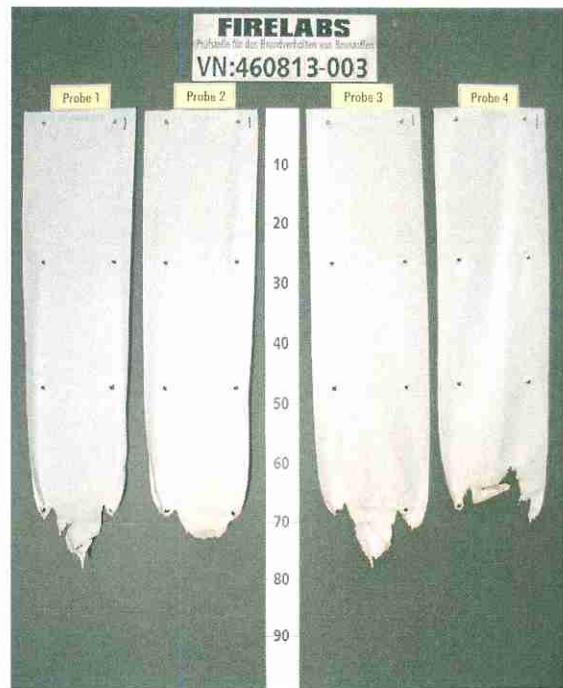


fig. 6
Photo of test specimen after the test

Test specimen D

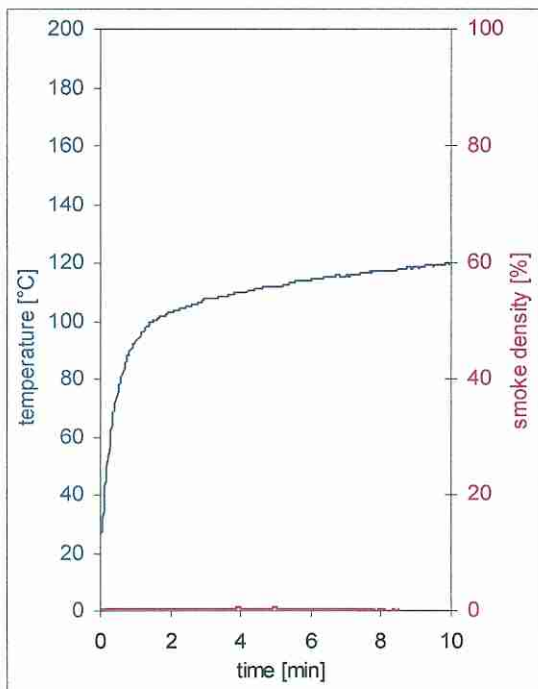


fig. 7
Graphs of the flue gas temperature and the smoke density

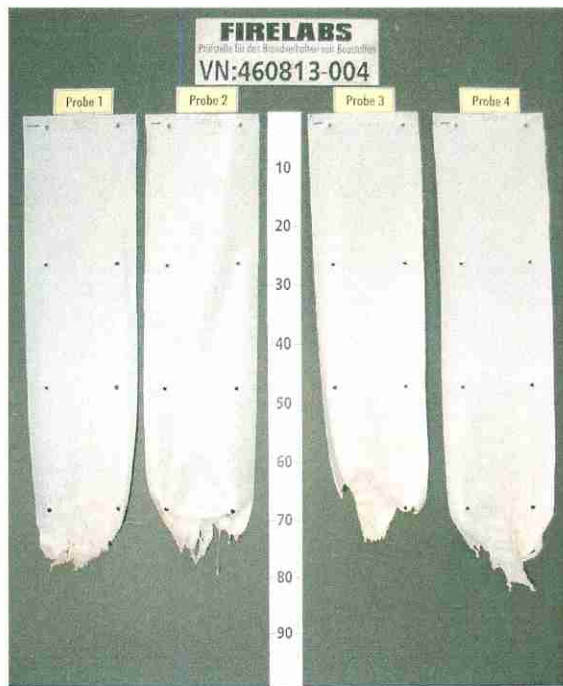


fig. 8
Photo of test specimen after the test



Test results class B2 (Brennkasten)

Table 2.1

| DirectTex® Flag 110 | longitudinal direction | | | | | | | transversal direction | | | | | | | dim. | requirements |
|--|------------------------|-----|-----|-----|-----|-----|---|-----------------------|-----|-----|-----|-----|-----|---|------|--------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
| Sample-No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | - | - |
| Ignition of the sample | 1 | 2 | 3 | 4 | 5 | 6 | - | 1 | 2 | 3 | 4 | 5 | 6 | - | s | - |
| Maximum flame height | 1 | 1 | 1 | 1 | 1 | 2 | - | 1 | 1 | 1 | 1 | 1 | 2 | - | cm | - |
| Time of the maximum | 3 | 3 | 3 | 3 | 3 | 2 | - | 3 | 3 | 3 | 3 | 3 | 2 | - | s | - |
| Flame tip reached the 150 mm test mark | 3 | 3 | 3 | 3 | 3 | 3 | - | 3 | 3 | 3 | 3 | 3 | 3 | - | s | ≥ 20 |
| Flame has extinguished before reaching the test mark | ./. | ./. | ./. | ./. | ./. | ./. | - | ./. | ./. | ./. | ./. | ./. | ./. | - | s | - |
| Ignition of filter paper | 4 | 4 | 4 | 5 | 4 | 4 | - | 4 | 4 | 4 | 4 | 3 | 5 | - | s | 1) |
| Smoke development (visual) | low | | | | | | | low | | | | | | | - | - |
| Afterburning time | ./. | ./. | ./. | ./. | ./. | ./. | - | ./. | ./. | ./. | ./. | ./. | ./. | - | s | - |
| Flames have been extinguished | ./. | ./. | ./. | ./. | ./. | ./. | - | ./. | ./. | ./. | ./. | ./. | ./. | - | s | - |

View of the samples after the test (20 seconds after exposure the flame):
 The samples were destroyed mainly by melting in
 - longitudinal direction up to approx. 6 cm in height and approx. 2 cm in width,
 - transversal direction up to approx. 6 cm in height and 1,5 cm in width.

Samples 1-5: edge flame exposure
 Samples 6: surface flame exposure

Table 2.2

| | DirectTex® Poplin Plus | | | | | | | | DirectTex® Softimage Creaseless | | | | | | | | dim. | requirements |
|--|------------------------|-----|-----|-----|-----|-----|-----|-----|---------------------------------|-----|-----|-----|-----|-----|-----|-----|------|--------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | |
| Sample-No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | - | - |
| Ignition of the sample | 1 | 3 | 3 | 3 | 1 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | s | - |
| Maximum flame height | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 4 | 2 | 3 | cm | - |
| Time of the maximum | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 3 | 4 | s | - |
| Flame tip reached the 150 mm test mark | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s | ≥ 20 |
| Flame has extinguished before reaching the test mark | 4 | 7 | 6 | 6 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 4 | 5 | s | - |
| Ignition of filter paper | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s | 1) |
| Smoke development (visual) | low | | | | | | | | low | | | | | | | | - | - |
| Afterburning time | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s | - |
| Flames have been extinguished | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | ./. | s | - |

View of the samples after the test (20 seconds after exposure the flame):
 The samples were destroyed mainly by melting in longitudinal and transversal direction up to approx. 6 cm in height and approx. 2,5 cm in width.

Samples 1: edge flame exposure, longitudinal direction
 Samples 2-4: surface flame exposure, longitudinal direction
 Samples 5: edge flame exposure, transversal direction
 Samples 6-8: surface flame exposure, transversal direction



Table 2.3

| DirectTex® Softimage 240 | longitudinal direction | | | | | | | transversal direction | | | | | | | dim. | requirements |
|--|------------------------|-----|-----|-----|-----|-----|---|-----------------------|-----|-----|-----|-----|-----|---|------|--------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | | |
| Sample-No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | - | - |
| Ignition of the sample | 1 | 3 | 3 | 3 | 3 | 3 | - | 1 | 3 | 3 | 3 | 3 | 3 | - | s | - |
| Maximum flame height | 4 | 5 | 4 | 5 | 5 | 4 | - | 3 | 3 | 2 | 4 | 3 | 3 | - | cm | - |
| Time of the maximum | 5 | 6 | 5 | 6 | 8 | 5 | - | 5 | 5 | 4 | 6 | 5 | 5 | - | s | - |
| Flame tip reached the 150 mm test mark | ./. | ./. | ./. | ./. | ./. | ./. | - | ./. | ./. | ./. | ./. | ./. | ./. | - | s | ≥ 20 |
| Flame has extinguished before reaching the test mark | 6 | 6 | 5 | 10 | 11 | 6 | - | 5 | 5 | 5 | 7 | 6 | 5 | - | s | - |
| Ignition of filter paper | ./. | ./. | ./. | ./. | ./. | ./. | - | ./. | ./. | ./. | ./. | ./. | ./. | - | s | 1) |
| Smoke development (visual) | low | | | | | | | low | | | | | | | - | - |
| Afterburning time | ./. | ./. | ./. | ./. | ./. | ./. | - | ./. | ./. | ./. | ./. | ./. | ./. | - | s | - |
| Flames have been extinguished | ./. | ./. | ./. | ./. | ./. | ./. | - | ./. | ./. | ./. | ./. | ./. | ./. | - | s | - |
| View of the samples after the test (20 seconds after exposure the flame): The samples were destroyed mainly by melting in: - longitudinal direction up to approx. 5 cm in height and approx. 1,5 cm in width, - transversal direction up to 5-6 cm in height and 2 cm in width. | | | | | | | | | | | | | | | | |

Samples 1: edge flame exposure
 Samples 2-6: 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

