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Report no 5214038903-E

Test order	Determination of the fire code rating (BKZ): Full color range, according to the directive for fire police regulations, building materials and components, part B: Test specifications. Edition 1988 (with supplements)
Customer	Kvadrat, DK - 8400 Ebeltoft
Sampling	by customer
Test object	Lumo
Contact person	Lone Henriksen
Order date	9 June 2026
Receipt of the test objects	15 June 2026
Execution of the test	17 June 2026 till 14 July 2026
Test location	St. Gallen
Number of pages	11
Attachment	1) General Terms and Conditions for Empa Services
Archiving of the test objects	The remaining test objects will be archived for 1 year.

Abt. 401 – spja/zep/buno/bauk - controlled by:

Empa, Swiss Federal Laboratories for Materials Science and Technology,
Laboratory for Biomimetic Membranes and Textiles

Technical specialist



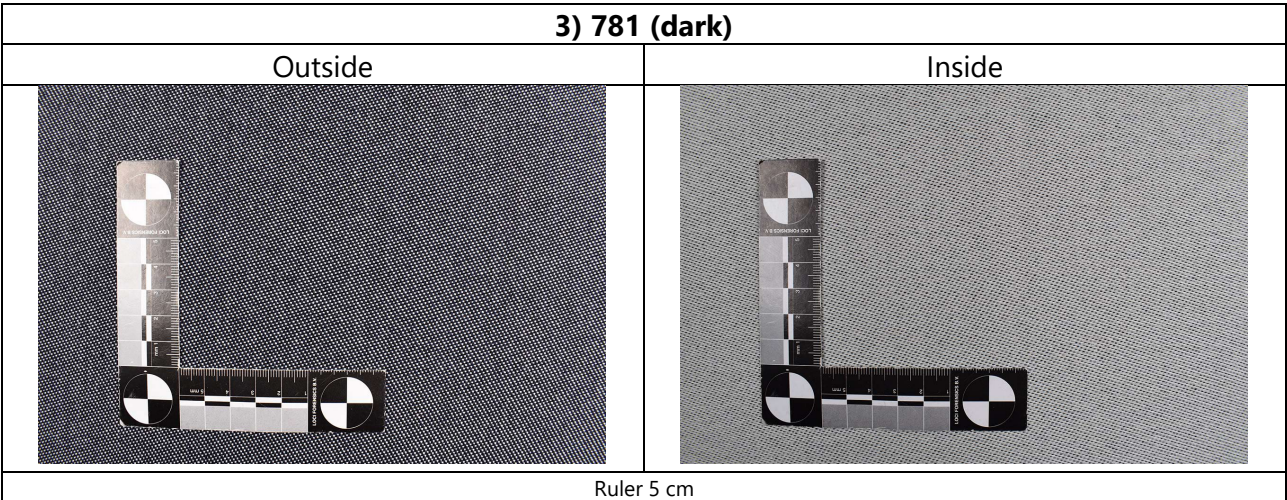
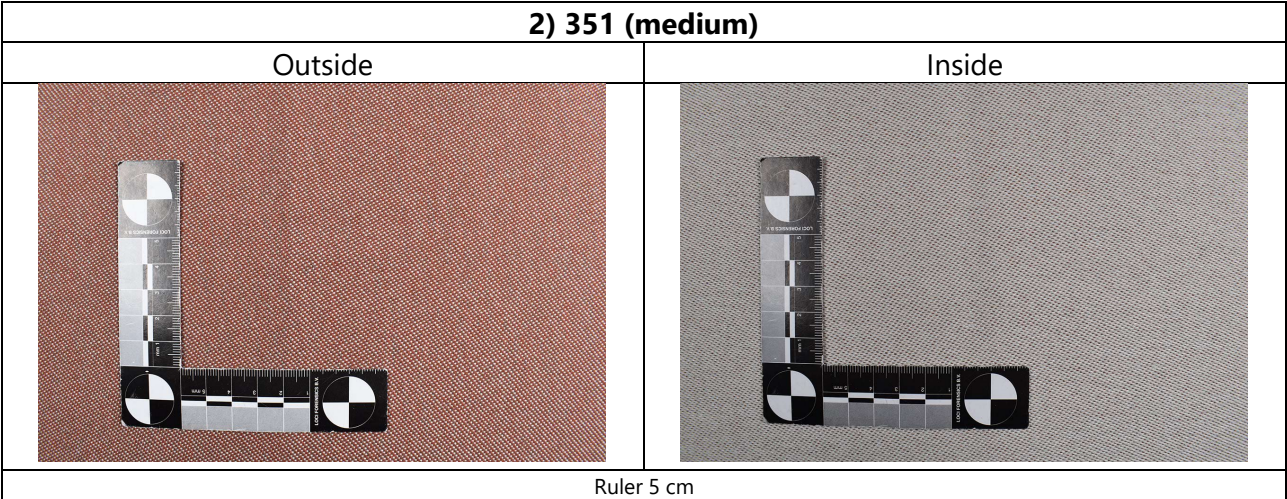
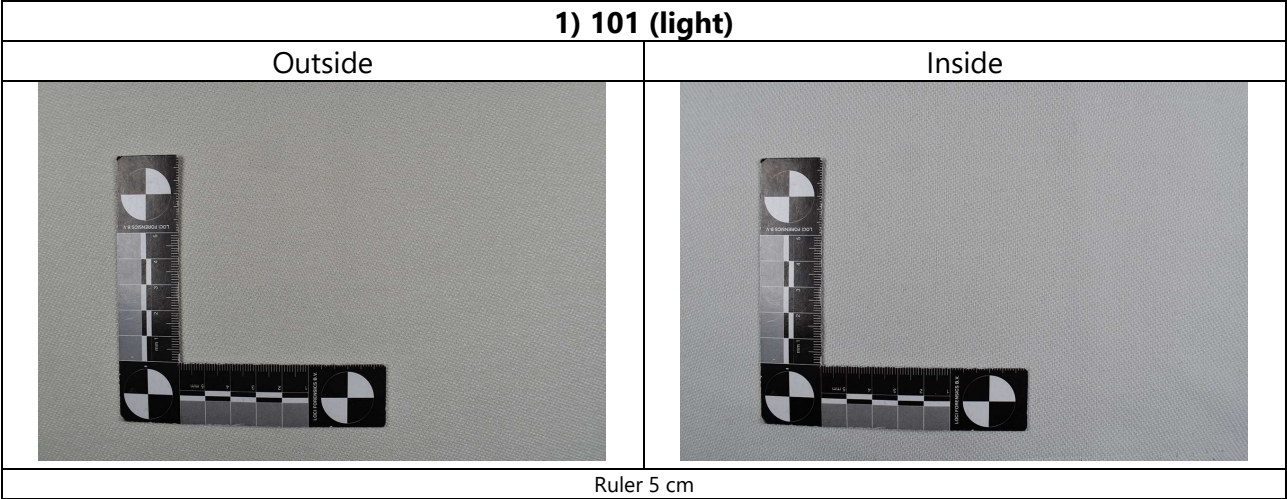
Contents

1.	Test object.....	3
2.	Images.....	4
3.	Performed tests	5
4.	Test methods.....	5
4.1	Flammability of textiles according to SN 198898:1987	5
4.1.1	Test conditions.....	5
4.1.2	Deviation from the standard	5
4.2	Determination of the smoke density according to VKF.....	6
4.2.1	Test conditions.....	6
4.2.2	Deviations from the standard	6
5.	Requirements according to VKF	6
5.1	Flammability of textiles according to SN 198898:1987	6
5.2	Determination of the smoke density according to VKF.....	6
6.	Results.....	7
6.1	1) [Test object 1]	7
6.1.1	Flammability of textiles according to SN 198898:1987	7
6.1.2	Smoke density according to VKF	7
6.2	2) [Test object 2]	8
6.2.1	Flammability of textiles according to SN 198898:1987	8
6.2.2	Smoke density according to VKF	8
6.3	3) [Test object 3]	9
6.3.1	Flammability of textiles according to SN 198898:1987	9
6.3.2	Smoke density according to VKF	9
7.	Fire protection classification according to the directive for fire police regulations, building materials and components, part B: Test conditions. Edition 1988.....	10
7.1	Remarks Fire protection classification	10
8.	Remarks.....	11

1. Test object

Declared according to order form
Test object Lumo
Material composition 100% polyester FR
Coating None
Thickness 1-2 mm
Weight value per unit area App. 300 g/m ² Informative measurements: 1) 313 g/m ² 2) 309 g/m ² 3) 309 g/m ²
Colors 1) 101 (light) 2) 351 (medium) 3) 781 (dark)
Sample size received 150cm x 300cm
Test condition as delivered, without pretreatment
Empa labelling 1, 2, 3

2. Images



3. Performed tests

- 4.1 Flammability of textiles according to SN 198898:1987 (Withdrawn: 1999-07-01)
- 4.2 Determination of the smoke density according to VKF

4. Test methods

4.1 Flammability of textiles according to SN 198898:1987

The acclimatized samples are suspended vertically in a combustion box and brought into contact with a propane gas flame from a burner positioned at 30° to the vertical for 3s and 15s at the lower edge.

In the case of samples that do not ignite by the flame, the destroyed distance and the glow time are determined, and in the case of samples that extinguish after flame exposure within the measuring distance, the destroyed distance, the burning time, and the glow time are determined. In addition, it is also determined whether the height of the flame peak is reached. It is recorded whether the samples melt or there is dripping debris. In the case of dripping, it is also assessed whether the dripping is burning and the blotting paper is ignited.

4.1.1 Test conditions

Apparatus	Ahiba Type FTG 70/A1 - Fab 72188
Marking thread	Cotton, raw 50/3 dtex
Gas	Propane, calorific value approx. 46 MJ/kg; (40 ± 2) mm flame length
Airflow	(0.1 to 0.2) m/s
Test climate	28.3 °C / 47.6 % RH
Sample acclimatization	≥ 24 h at (20 ± 2) °C / (65 ± 4) % RH
Number of samples	20 (10 in longitudinal and 10 in transverse direction)
Size of the samples	(105 x 450) mm
Attachment weight	250g

4.1.2 Deviation from the standard

The test objects were not pretreated prior to the test.

4.2 Determination of the smoke density according to VKF

A defined test specimen is exposed in a standardized test apparatus with a defined air flow rate and a defined flame exposure until it burns off. The maximum of the obscuration (light absorption) produced by the smoke is measured by photometry.

The smoke density is determined with three tests. If they do not result in a matching classification, the number of attempts is extended to six, and the maximum and minimum values are excluded. The average of the four remaining results is decisive for the classification.

4.2.1 Test conditions

Apparatus	Smoke intensity tester (Qualmintensitäts-Tester) QIT No. 26
Gas	Propane, pressure approx. 0.5 bar
Flame height	150 mm
Air influx	(6.0 bis 6.5) l/s
Sample acclimatization	≥ 24 h at $(20 \pm 2) ^\circ\text{C}$ / $(65 \pm 4) \% \text{ RH}$
Number of samples	3 (up to 6)
Size of the samples	Compact materials: (30 x 30) mm, thickness 4 mm $\pm$ 10%
Sample holder	Bowl

4.2.2 Deviations from the standard

The test objects were not pretreated prior to the test.

5. Requirements according to VKF

5.1 Flammability of textiles according to SN 198898:1987

Flammability grade 5 is achieved when 18 of the 20 Samples meet all requirements.

Classification	Requirements
Flammability grade 5	Peak of flame ≤ 400 mm
	Afterflame time < 5 s
	Afterglow time ≤ 5 min
	Damaged length ≤ 150 mm

Table 1: Requirements according to VKF for achieving the flammability grade 5.

5.2 Determination of the smoke density according to VKF

The decisive criterion for classification is light absorption

Classification	Requirements
Smoke density level 1	Maximum light absorption $> 90\%$
Smoke density level 2	Maximum light absorption $> 50 - 90\%$
Smoke density level 3	Maximum light absorption $0 - 50\%$

Table 2: Requirements according to VKF for classification of the smoke density test.

6. Results

6.1 Test object 1) 101 (light)

6.1.1 Flammability of textiles according to SN 198898:1987

Sample no.	After flame time [s]	Afterglow time [s]	Damaged length [mm]	Peak of flame reached [>400mm]	Melt and/or drop off	Burning droplets	Ignition blotting paper
Longitudinal: Ignition time 3 s							
1	1	-	41	no	melt	-	-
2	1	-	38	no	melt	-	-
3	1	-	43	no	melt	-	-
4	1	-	40	no	melt	-	-
5	1	-	52	no	melt	-	-
Longitudinal: Ignition time 15 s							
1	-	-	71	no	melt	-	-
2	-	-	73	no	melt	-	-
3	-	-	74	no	melt	-	-
4	-	-	66	no	melt and drop off	yes	no
5	-	-	82	no	melt and drop off	no	-
Transverse: Ignition time 3 s							
1	1	-	45	no	melt and drop off	no	-
2	1	-	40	no	melt	-	-
3	1	-	38	no	melt and drop off	yes	no
4	2	-	36	no	melt and drop off	yes	no
5	2	-	37	no	melt and drop off	yes	no
Transverse: Ignition time 15 s							
1	-	-	94	no	melt and drop off	yes	no
2	-	-	69	no	melt and drop off	yes	no
3	-	-	57	no	melt and drop off	yes	no
4	-	-	64	no	melt and drop off	yes	no
5	-	-	78	no	melt	-	-

Table 3: Single results of the flammability of textiles according to SN 198898:1987. Measurement results that do not meet the requirements are marked yellow.

The test object 1 meets the requirements for flammability grade 5 according to VKF.

6.1.2 Smoke density according to VKF

Maximum light absorption (%)	Sample 1	Sample 2	Sample 3	Sample 4	Average
	73	74	70	-	72

Table 4: Results of the smoke density test.

Maximum light absorption 72 % corresponds to smoke density level 2, medium smoke density.

6.2 Test object 2) 351 (medium)

6.2.1 Flammability of textiles according to SN 198898:1987

Sample no.	After flame time [s]	Afterglow time [s]	Damaged length [mm]	Peak of flame reached [>400mm]	Melt and/or drop off	Burning droplets	Ignition blotting paper
Longitudinal: Ignition time 3 s							
1	1	-	43	no	melt and drop off	yes	no
2	1	-	50	no	melt and drop off	yes	no
3	1	-	41	no	melt and drop off	yes	no
4	1	-	48	no	melt and drop off	yes	no
5	1	-	45	no	melt	-	-
Longitudinal: Ignition time 15 s							
1	-	-	80	no	melt	-	-
2	-	-	83	no	melt and drop off	no	-
3	-	-	85	no	melt and drop off	yes	no
4	-	-	84	no	melt and drop off	yes	no
5	-	-	85	no	melt and drop off	yes	no
Transverse: Ignition time 3 s							
1	1	-	41	no	melt and drop off	no	-
2	1	-	39	no	melt and drop off	yes	no
3	1	-	45	no	melt and drop off	yes	no
4	0	-	36	no	melt and drop off	no	-
5	1	-	47	no	melt	-	-
Transverse: Ignition time 15 s							
1	16	-	95	no	melt and drop off	no	-
2	19	-	103	no	melt and drop off	no	-
3	-	-	63	no	melt and drop off	yes	no
4	-	-	88	no	melt and drop off	yes	no
5	-	-	95	no	melt and drop off	yes	no

Table 5: Single results of the flammability of textiles according to SN 198898:1987. Measurement results that do not meet the requirements are marked yellow.

The test object 2 meets the requirements for flammability grade 5 according to VKF.

6.2.2 Smoke density according to VKF

	Sample 1	Sample 2	Sample 3	Sample 4	Average
Maximum light absorption (%)	46	48	46	-	47

Table 6: Results of the smoke density test.

Maximum light absorption 47 % corresponds to smoke density level 3, light smoke density.

6.3 Test object 3) 781 (dark)

6.3.1 Flammability of textiles according to SN 198898:1987

Sample no.	After flame time [s]	Afterglow time [s]	Damaged length [mm]	Peak of flame reached [>400mm]	Melt and/or drop off	Burning droplets	Ignition blotting paper
Longitudinal: Ignition time 3 s							
1	2	-	44	no	melt and drop off	yes	no
2	1	-	46	no	melt	-	-
3	1	-	43	no	melt	-	-
4	1	-	42	no	melt and drop off	yes	no
5	1	-	49	no	melt	-	-
Longitudinal: Ignition time 15 s							
1	-	-	62	no	melt and drop off	yes	no
2	-	-	78	no	melt and drop off	yes	no
3	-	-	63	no	melt and drop off	yes	no
4	-	-	70	no	melt and drop off	yes	no
5	-	-	71	no	melt and drop off	yes	no
Transverse: Ignition time 3 s							
1	1	-	45	no	melt	-	-
2	1	-	41	no	melt	-	-
3	0	-	40	no	melt	-	-
4	1	-	40	no	melt	-	-
5	1	-	42	no	melt	-	-
Transverse: Ignition time 15 s							
1	-	-	66	no	melt and drop off	yes	no
2	-	-	74	no	melt and drop off	no	-
3	-	-	93	no	melt	-	-
4	-	-	74	no	melt and drop off	no	-
5	-	-	79	no	melt and drop off	no	-

Table 7: Single results of the flammability of textiles according to SN 198898:1987. Measurement results that do not meet the requirements are marked yellow.

The test object 3 meets the requirements for flammability grade 5 according to VKF.

6.3.2 Smoke density according to VKF

	Sample 1	Sample 2	Sample 3	Sample 4	Average
Maximum light absorption (%)	55	50	58	55	55

Table 8: Results of the smoke density test.

Maximum light absorption 55 % corresponds to smoke density level 2, medium smoke density.

7. Fire protection classification¹ according to the directive for fire police regulations, building materials and components, part B: Test conditions. Edition 1988²

Fire protection classification: 5.2

7.1 Remarks Fire protection classification

- According to VKF, Collection of Decisions of the Technical Committee on Building Technology, Nationally Standardized Tests for Building Materials and Components, Version 2.3, dated 26.11.2019: If a building material (e.g. textiles, fabrics, films, etc.) is available in different color variants, DIN 4102-16 (September 2015) applies regarding the selection of color variants to be tested. If the test results are positive, they apply to all colors.
- If the three colors have different classifications, the lowest rating applies to all colors. This applies to the flammability and the smoke density.

¹ The measurement uncertainty is not considered in conformity assessment.

² Association of Swiss Canton Fire Insurance Companies (VKF), Bundesgasse 20, CH-3001 Bern, Phone: +41 (0)31 320 22 22, www.vkf.ch

8. Remarks

- The test results are only valid for the test object presented.
- Information on the measurement uncertainty can be requested from the laboratory.
- The measurement uncertainty is not considered in conformity assessments.
- The report and documents are kept for ten (10) years.
- If the client does not wish to take back the test objects, Empa is entitled to freely dispose of or destroy the test objects one (1) year after completion of its activities.
- This report is only available as a PDF. Translations are marked as such on the cover page.
- All tests are carried out under a quality management system in accordance with EN ISO/IEC 17025. Empa's Biomimetic Membranes and Textiles department is accredited as a testing laboratory by the national Swiss Accreditation Service (SAS). The scope of accreditation is listed on the SAS website.
- An accreditation logo on the test report indicates that at least one test method is accredited. Non-accredited test procedures are marked with *. However, these test procedures were performed at the same quality level as the accredited tests.
- Sampling, which the customer usually carries out, is outside the accredited range.
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