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Anerkannte Prüfstelle für Baustoffe, Bauteile und Bauarten

PÜZ-Stelle nach Landesbauordnung (SAC 02), Bauproduktengesetz (NB 0800)

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MFPA

Business division III – Structural fire protection

Head of business division: Dr.-Ing. Peter Nause

Working group 3.1 – Fire behaviour of structural components

-Certified translation from German -

Test Certificate

PZ 3.1/11-096-2

dated 07/06/2011 1st copy

Client:	Gebrüder Aurich GmbH Otto-Hahn-Strasse 11 42477 Radevormwald
Subject matter:	Test for low flammability (building material class B1) according to DIN 4102 Part 1, May 1998 issue
Object:	Woven and knitted fabrics of polyethylene, color white
Order date:	11/01/2011
Samples received on:	17/01/2011 (file number DZ 3.1/11-011)
Sampling:	by client
Identification:	without
Test date:	08/ 20/04/18/05/2011 (test in fire shaft), 12/04 /18/05/2011 (test in fire box)
Prepared by:	Dipl.-Phys. Günter Brinkmann

This test certificate includes 12 text sheets and 11 Annexes.

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1 Description of material

According to the client, the building products to be tested were white woven and/or knitted fabrics of polyester provided with a flame-proofing agent.
According to the client, the products with the designation 350FRn and 3152FRn were provided with an alternative flame-proofing agent as compared with the other products.
According to the client, the materials are used for the fabrication of banners and flags inside of buildings. According to the client, the materials were not backed by other materials when used in the building industry.

No other information about the materials and their use were available to the test board.

2 Preparation of samples

The samples for the fire tests were cut to size at the test site from material which was provided by the client.
The samples were taken from the longitudinal and transverse direction of the material.

3 Material parameters

Parameters provided by client:

Designation:	Weight per unit area [g/m²]:
2187FR knitted fabric	approx. 50
3153FR knitted fabric	approx. 280
637FR woven fabric	approx. 68
6083FR woven fabric	approx. 330

MFPA Leipzig determined the following parameters:

Designation:	Weight per unit area [g/m²]:
2187FR knitted fabric	approx. 46
3153FR knitted fabric	approx. 277
637FR woven fabric	approx. 65
6083FR woven fabric	approx. 345
350FRn	approx. 112
3152FRn	approx. 205

4 Testing

The tests were carried out according to DIN 4102 Part 1 (May 1998 issue), DIN 4102 Part 15 (May 1990 issue) and DIN 4102 Part 16 (May 1998 issue).

The tests at the above materials were carried out in the fire shaft according to DIN 4102 Part 1, Section 6.1.2.2 and in the fire box according to DIN 4102 Part 1, Section 6.2.5.2 with the samples in freely suspended arrangement.

5 Test results

The test results are summarized in the following tables 1 to 5.

Table 1: Test in fire shaft according to DIN 4102 Part 1, Section 6.1.2.2

Woven and/or knitted fabric of polyester, color white,
Freely suspended sample arrangement;

Specimen A: Woven fabric 637FR, samples from longitudinal direction,
Specimen B: Woven fabric 6083FR, samples from transverse direction,
Specimen C: Knitted fabric 2187FR, samples from longitudinal direction,
Specimen D: Knitted fabric 3153FR, samples from transverse direction;

Line No.			Measuring values for specimen A	B	C	D
1	No. of sample arrangement acc. to DIN 4102 Part 15, Table 1		1	1	1	1
2	Maximum flame height above bottom edge of sample	cm	35	40	30	35
3	Time*)	min:s	0:15	0:05	0:02	2:00
4	Melting through/burning through Time*)	min:s	0:02	0:05	0:02	0:04
5	Findings at the rear side of sample Flames/glowing Time*)	min:s	./.	./.	./.	./.
6	Discoloration Time*)	min:s	./.	./.	./.	./.
7	Burning dripping down Beginning*)	min:s	./.	./.	./.	./.
8	Extent: occasionally dripping down sample material		-	-	-	-
9	Continuously dripping down sample material		-	-	-	-
10	Burning dropping down sample parts Beginning*)	min:s	./.	./.	./.	./.
11	Extent: occasionally dropping down sample parts		-	-	-	-
12	Continuously dropping down sample parts		-	-	-	-
13	Period of continued burning at screen plate (max.)	min:s	-	-	-	-
14	Impairment of burner flame by dripping down/dropping down parts Time*)	min:s	./.	./.	./.	./.
15	Premature end of test End of fire at samples*)	min:s	./.	./.	./.	./.
16	Time of aborted test, if any*)	min:s	./.	./.	./.	./.

*) Time from beginning of test
./. Event did not occur
- No information

Table 1 continued:

Line No.			Measuring values for specimen A	B	C	D
	<u>After-burning at end of test</u>					
17	Period	min:s	./.	./.	./.	./.
18	Number of samples		-	-	-	-
19	Front side of sample		-	-	-	-
20	Rear side of sample		-	-	-	-
21	Flame length	cm	-	-	-	-
	<u>After-glowing at end of test</u>					
22	Period	min:s	./.	./.	./.	./.
23	Number of samples		-	-	-	-
	Point of occurrence:					
24	Bottom sample half		-	-	-	-
25	Top sample half		-	-	-	-
26	Front side of sample		-	-	-	-
27	Rear side of sample		-	-	-	-
	<u>Smoke density</u>					
28	max. 400 % min	%min	< 1	2	< 1	4
29	> 400 % min (very strong smoke development)	%min	./.	./.	./.	./.
30	Diagram in Annex No.		4	5	6	7
	<u>Residual lengths</u>					
31	Individual values	cm	69; 70 69; 68	65; 62 66; 64	62; 61 72; 54	63; 64 62; 62
32	Mean value	cm	69	64	62	63
33	Photo of specimen in Annex No.		1	1	2	2
	<u>Flue gas temperature</u>					
34	Maximum of mean value	°C	119	112	120	116
35	Time*)	min:s	7:26	2:18	9:22	9:46
36	Diagram in Annex No.		4	5	6	7
37	<u>Remarks:</u> - none;					

*) Time from beginning of test
./. Event did not occur
- No information

Table 2: Test in fire shaft according to DIN 4102 Part 1, Section 6.1.2.2

Woven and/or knitted fabric of polyester, color white,
Freely suspended sample arrangement;

Specimen E: Woven fabric 6083FR, samples from longitudinal direction,
Specimen F: Knitted fabric 2187FR, samples from transverse direction,
Specimen G: 350FRn, samples from longitudinal direction,
Specimen H: 3152FRn, samples from longitudinal direction;

Line No.			Measuring values for specimen E	F	G	H
1	No. of sample arrangement acc. to DIN 4102 Part 15, Table 1		1	1	1	1
2	Maximum flame height above bottom edge of sample	cm	40	35	40	40
3	Time*)	min:s	0:15	0:10	0:05	0:05
4	Melting through/burning through Time*)	min:s	0:05	0:01	0:02	0:04
5	Findings at the rear side of sample Flames/glowing Time*)	min:s	./.	./.	./.	./.
6	Discoloration Time*)	min:s	./.	./.	./.	./.
7	Burning dripping down Beginning*)	min:s	./.	./.	0:10	0:12
8	Extent: occasionally dripping down sample material		-	-	yes	yes
9	Continuously dripping down sample material		-	-	no	no
10	Burning dropping down sample parts Beginning*)	min:s	./.	./.	./.	./.
11	Extent: occasionally dropping down sample parts		-	-	-	-
12	Continuously dropping down sample parts		-	-	-	-
13	Period of continued burning at screen plate (max.)	min:s	-	-	0:00	0:00
14	Impairment of burner flame by dripping down/dropping down parts Time*)	min:s	./.	./.	./.	./.
15	Premature end of test End of fire at samples*)	min:s	./.	./.	./.	./.
16	Time of aborted test, if any*)	min:s	./.	./.	./.	./.

*) Time from beginning of test
./. Event did not occur
- No information

Table 2 continued:

Line No.			Measuring values for specimen E	F	G	H
	<u>After-burning at end of test</u>					
17	Period	min:s	./.	./.	./.	./.
18	Number of samples		-	-	-	-
19	Front side of sample		-	-	-	-
20	Rear side of sample		-	-	-	-
21	Flame length	cm	-	-	-	-
	<u>After-glowing at end of test</u>					
22	Period	min:s	./.	./.	./.	./.
23	Number of samples		-	-	-	-
	Point of occurrence:					
24	Bottom sample half		-	-	-	-
25	Top sample half		-	-	-	-
26	Front side of sample		-	-	-	-
27	Rear side of sample		-	-	-	-
	<u>Smoke density</u>					
28	max. 400 % min	%min	3	< 1	< 1	1
29	> 400 % min (very strong smoke development)	%min	./.	./.	./.	./.
30	Diagram in Annex No.		8	9	10	11
	<u>Residual lengths</u>					
31	Individual values	cm	73; 69 65; 67	54; 58 67; 58	68; 69 68; 69	69; 68 70; 69
32	Mean value	cm	68	59	68	69
33	Photo of specimen in Annex No.		-	-	3	3
	<u>Flue gas temperature</u>					
34	Maximum of mean value	°C	117	120	115	120
35	Time*)	min:s	9:18	9:38	8:46	9:26
36	Diagram in Annex No.		8	9	10	11
37	<u>Remarks:</u> - none;					

*) Time from beginning of test
./. Event did not occur
- No information

Table 3: Test in fire box according to DIN 4102 Part 1, Section 6.2.5.2 (edge flaming)

Woven and/or knitted fabric of polyester, color white,
Freely suspended sample arrangement;

Samples 1, 3, 4 and 6: Longitudinal direction,
Samples 2 and 5: Transverse direction;

Samples 1 to 3: Woven fabric 637FR,
Samples 4 to 6: Woven fabric 6083FR;

Data acc. to DIN 4102 Part 1		Test results Sample No. 1	2	3	4	5	6
Inflammation	s	1	1	1	1	1	1
Max. flame height	mm	140	110	90	50	40	50
Time of occurrence	s	12	7	7	6	6	6
Flame peak at measuring mark	s	./.	./.	./.	./.	./.	./.
Extinguishing of flame prior to reaching the measuring mark	s	14	21	15	7	7	7
Continued burning after end of test	s	./.	./.	./.	./.	./.	./.
Ignition of filter paper	s	./.	./.	./.	./.	./.	./.

Appearance of samples after the fire tests:

The samples were damaged at the flaming side at a length of max. 140 mm and at the bottom edge at a width of max. 15 mm.

Burning dropping down/dripping down did not occur.

Smoke development (visual): low moderate strong very strong

./. Event did not occur

Table 4: Test in fire box according to DIN 4102 Part 1, Section 6.2.5.2 (edge flaming)

Woven and/or knitted fabric of polyester, color white,
Freely suspended sample arrangement;

Samples 1, 3 and 4: Longitudinal direction,
Samples 2, 5 and 6: Transverse direction;

Samples 1 to 3: Knitted fabric 2187FR,
Samples 4 to 6: Knitted fabric 3153FR;

Data acc. to DIN 4102 Part 1		Test results Sample No. 1	2	3	4	5	6
Inflammation	s	1	1	1	1	1	1
Max. flame height	mm	20	20	20	30	40	40
Time of occurrence	s	2	2	2	5	5	4
Flame peak at measuring mark	s	./.	./.	./.	./.	./.	./.
Extinguishing of flame prior to reaching the measuring mark	s	2	2	2	6	8	11
Continued burning after end of test	s	./.	./.	./.	./.	./.	./.
Ignition of filter paper	s	./.	./.	./.	./.	./.	./.

Appearance of samples after the fire tests:

The samples were damaged at the flaming side at a length of max. 140 mm and at the bottom edge at a width of max. 15 mm.

Burning dropping down/dripping down did not occur.

Smoke development (visual): low moderate strong very strong

./. Event did not occur

Table 5: Test in fire box according to DIN 4102 Part 1, Section 6.2.5.2 (edge flaming)

Woven and/or knitted fabric of polyester, color white,
Freely suspended sample arrangement;

Samples 1, 3 and 4: Longitudinal direction,
Samples 2, 5 and 6: Transverse direction;

Samples 1 to 3: 350FRn,
Samples 4 to 6: 3152FRn;

Data acc. to DIN 4102 Part 1		Test results Sample No. 1	2	3	4	5	6
Inflammation	s	1	1	1	1	1	1
Max. flame height	mm	20	20	20	40	40	40
Time of occurrence	s	2	2	2	3	2	2
Flame peak at measuring mark	s	./.	./.	./.	./.	./.	./.
Extinguishing of flame prior to reaching the measuring mark	s	3	2	2	3	3	3
Continued burning after end of test	s	./.	./.	./.	./.	./.	./.
Ignition of filter paper	s	./.	./.	./.	./.	./.	./.

Appearance of samples after the fire tests:

The samples were damaged at the flaming side at a length of max. 75 mm and at the bottom edge at a width of max. 20 mm.

Burning dropping down/dripping down did not occur.

Smoke development (visual): low moderate strong very strong

./. Event did not occur

6 Evaluation

6.1 Test in fire box according to DIN 4102 Part 1, Section 6.2.5.2

The white woven and knitted fabrics of polyester with the weight per unit area from approx. 46 g/m² to approx. 345 g/m² met the requirements of building material class B2 (normally inflammable) according to DIN 4102 Part 1, Section 6.2.

When tested according to DIN 4102 Part 1, Section 6.2.6, the materials are deemed non-burning dropping down (dripping down).

6.2 Test in fire shaft according to DIN 4102 Part 1, Section 6.1.2.2

The white woven and knitted fabrics of polyester with the weight per unit area from approx. 46 g/m² to approx. 345 g/m² in freely suspended sample arrangement met the test in the fire shaft according to DIN 4102 Part 1, Section 6.1.2.2.

When tested according to DIN 4102 Part 16, Section 9.3, the materials are deemed non-burning dropping down (dripping down).

The following evaluation shall be applicable to the following materials of white color:

2187FR
637FR
350FR
379FR
2152V3FR
3151FR
3153FR
6083FR
350FRn
3152FRn

Thus the above products can be classified in building class B1 (hardly inflammable) according to DIN 4102 under the following conditions:

- The above white woven and knitted fabrics of polyester with weights per unit area from approx. 46 g/m² to approx. 345 g/m² shall be arranged at a distance of > 40 mm to equal or other flat materials.
- When used as hardly inflammable materials, the above products shall not be exposed to the weather in the open area.

7 Specific notes

When installed permanently in buildings or building structures, banners and flags may be deemed building products according to § 2 Abs. 9 of the building regulations. Suitability of the above products as building products shall then be demonstrated by verification of applicability according to the regional building laws of the Federal Republic of Germany.

For the purpose of the procedure of the Building Inspectorate, this test certificate is used as basis for the prescribed verification of applicability.

This test certificate shall not substitute the general test certificate, if any, of the Building Inspectorate required in the procedure of the Building Inspectorate. It shall be used only as basis for the preparation of a general test certificate of the Building Inspectorate.

The results of the tests refer exclusively to the test objects described and not to the universe.

The validity of this test certificate expires on 07/04/2016.

Leipzig, 07/06/2011

Dr.-Ing. P. Nause
Head of business division

Dipl.-Phys. I. Kotthoff
Head of test board

Having been publicly appointed and generally sworn in as a translator for English by the President of the Leipzig Regional Court, I hereby certify the above translation of the document submitted to me as an original in the German language to be correct and complete.

Leipzig, 14/06//2011

öffentlich bestellte und allgemein beeidigte Übersetzerin für die englische Sprache
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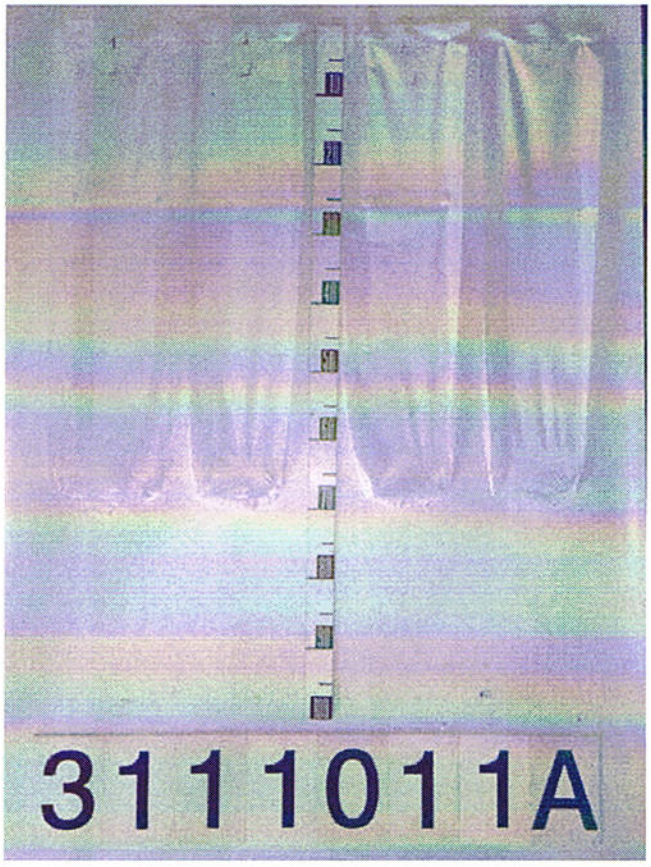
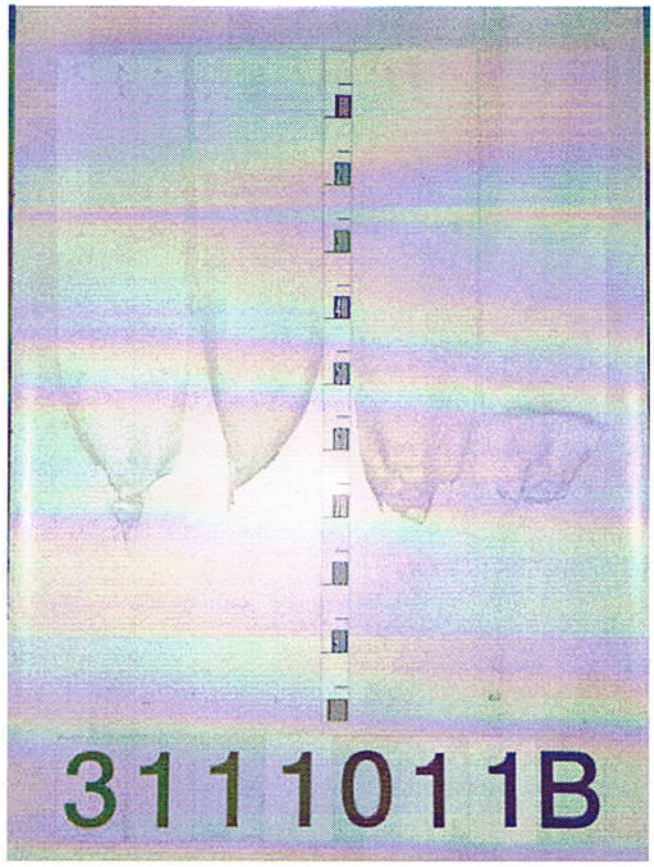
04349 Leipzig



Damage of fire shaft samples:
Specimen A;

Woven fabric of polyester 637FR,
Color white,

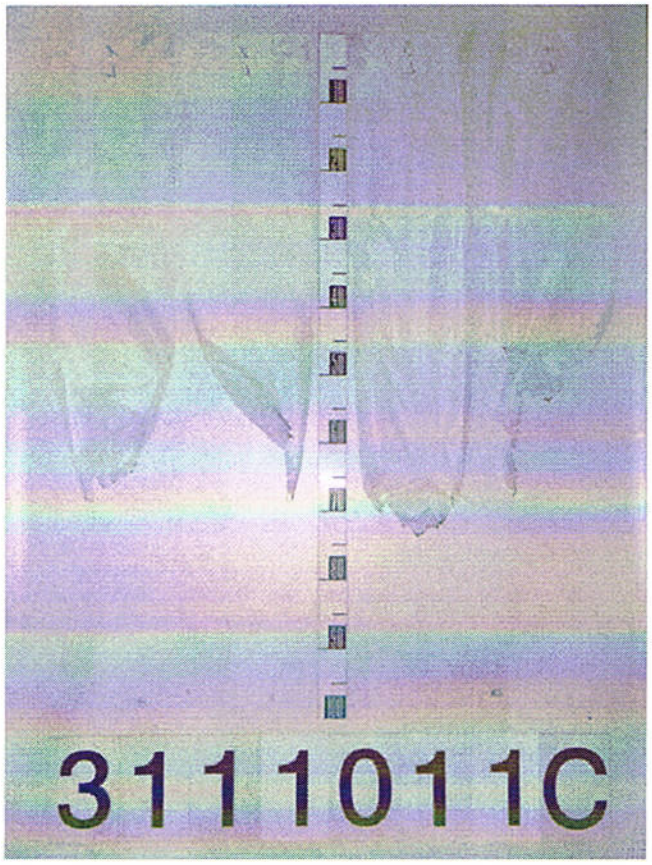
Samples from longitudinal direction,
Freely suspended sample arrangement;



Damage of fire shaft samples:
Specimen B;

Woven fabric of polyester 6083FR,
Color white,

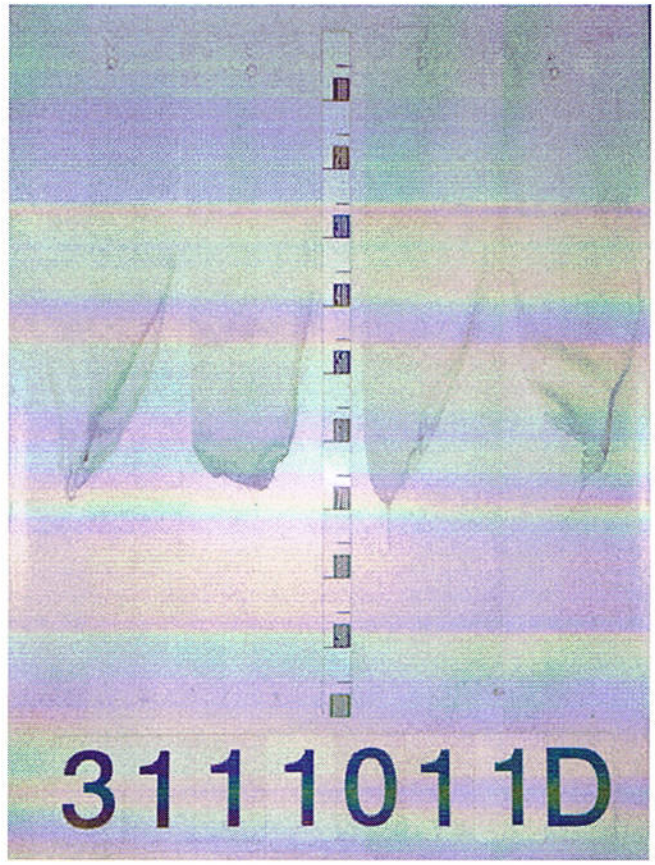
Samples from transverse direction,
Freely suspended sample arrangement;



Damage of fire shaft samples:
Specimen C;

Knitted fabric of polyester 2187FR,
Color white,

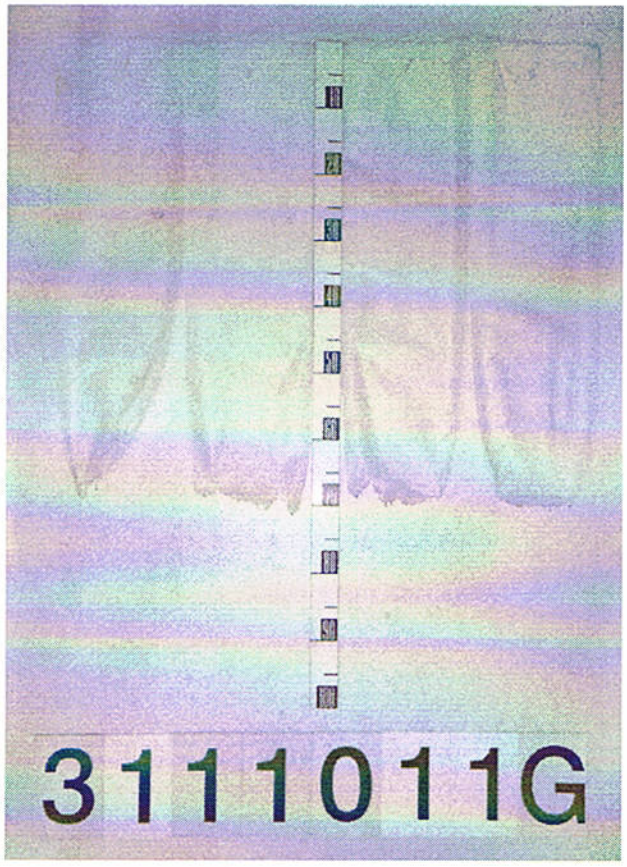
Samples from longitudinal direction,
Freely suspended sample arrangement;



Damage of fire shaft samples:
Specimen D;

Knitted fabric of polyester 3153FR,
Color white,

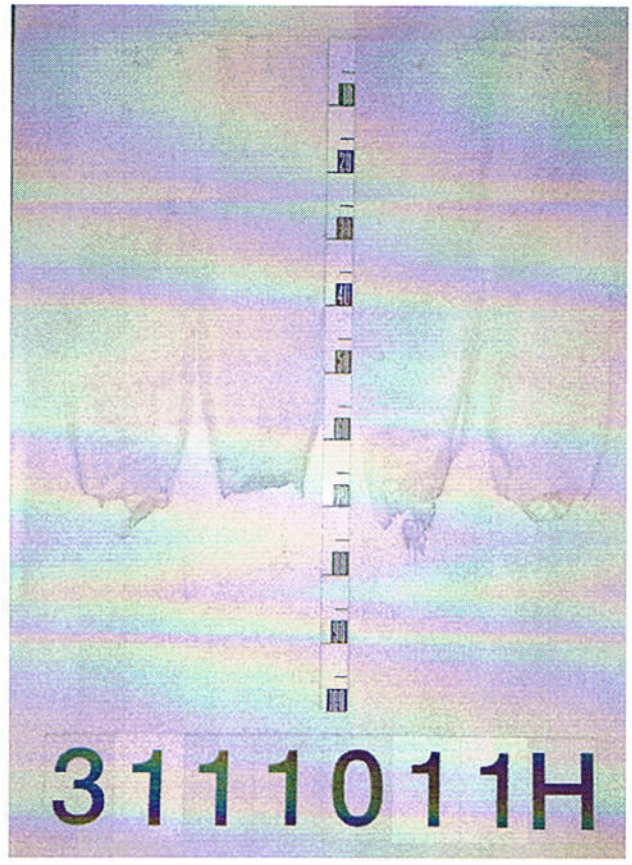
Samples from transverse direction,
Freely suspended sample arrangement;



Damage of fire shaft samples:
Specimen G;

Woven and/or knitted fabric of polyester 350FRn,
Color white,

Samples from longitudinal direction,
Freely suspended sample arrangement;



Damage of fire shaft samples:
Specimen H;

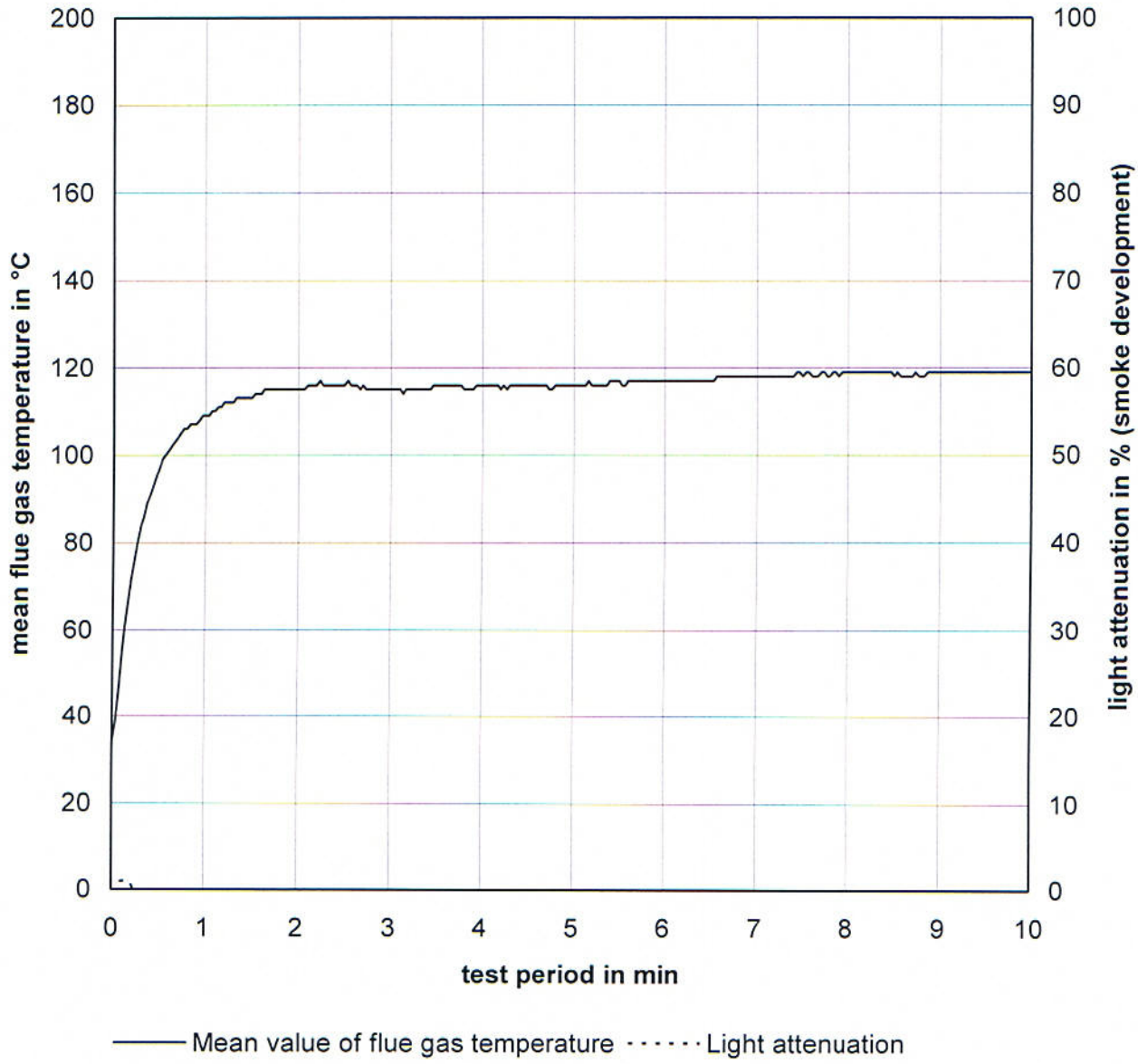
Woven and/or knitted fabric of polyester 3152FRn,
Color white,

Samples from longitudinal direction,
Freely suspended sample arrangement;

Flue gas temperatures and smoke development
Fire shaft test on 08/04/2011

Specimen A: Woven fabric of polyester 637FR, color white,
Weight per unit area approx. 65 g/m²,
Freely suspended sample arrangement,
Samples from longitudinal direction;

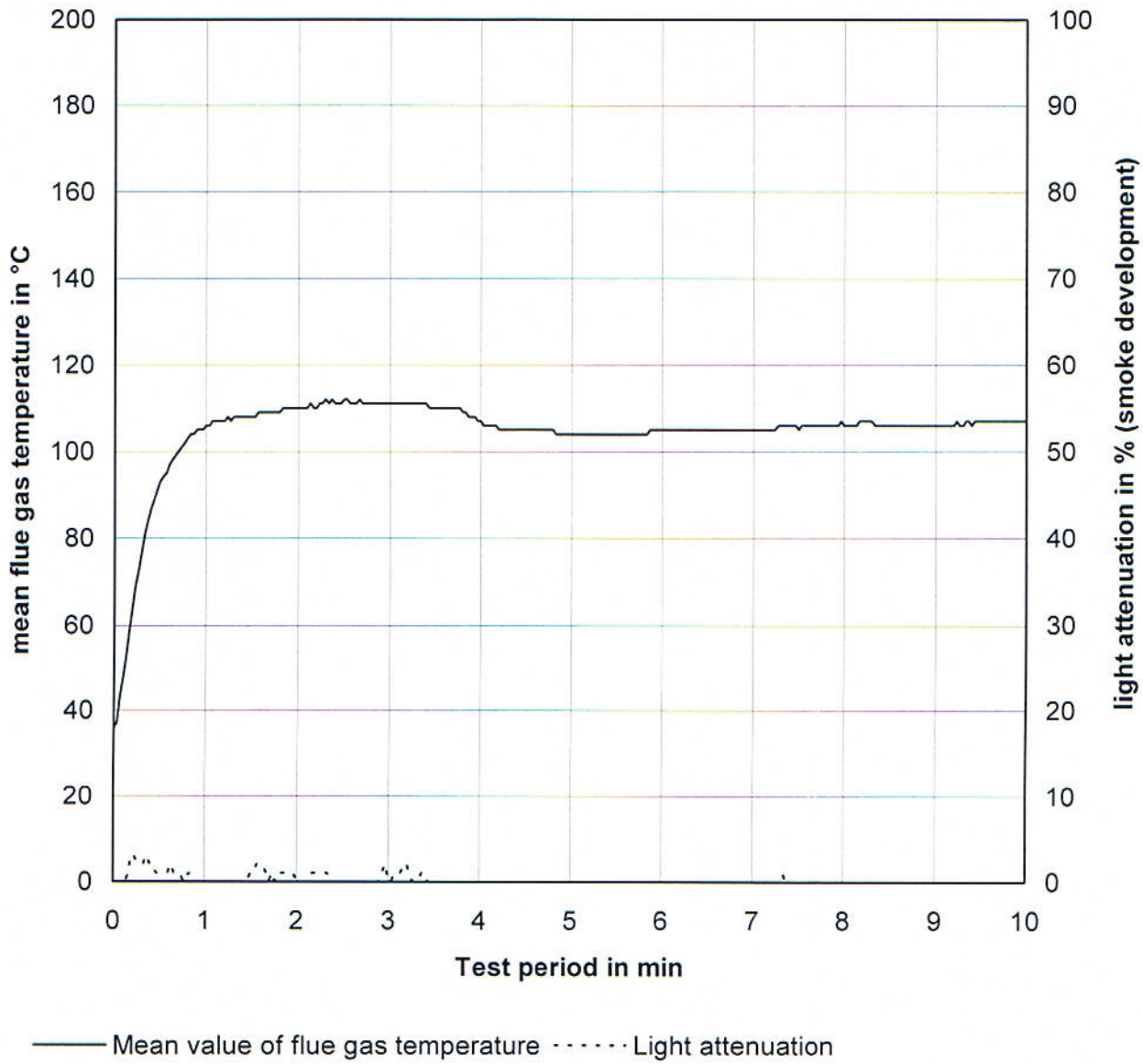
Maximum of mean flue gas temperature: 119 °C after 7:26 min:s
Surface integral of smoke density: < 1 %min



Flue gas temperatures and smoke development
Fire shaft test on 08/04/2011

Specimen B: Woven fabric of polyester 6083FR, color white,
Weight per unit area approx. 345 g/m²,
Freely suspended sample arrangement,
Samples from transverse direction;

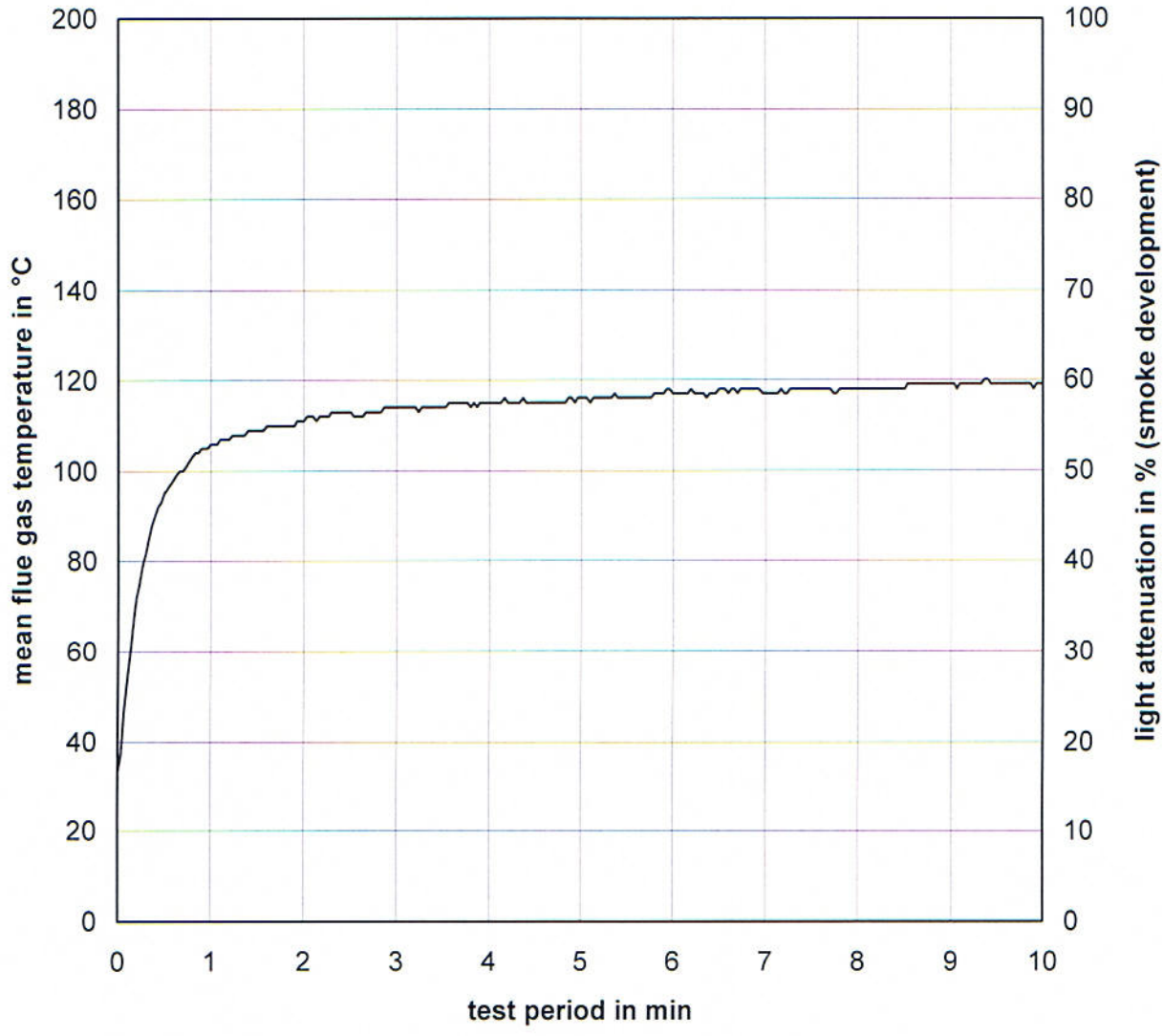
Maximum of mean flue gas temperature: 112 °C after 2:18 min:s
Surface integral of smoke density: 2 %min



Flue gas temperature and smoke development
Fire shaft test on 08/04/2011

Specimen C: Knitted fabric of polyester 2187FR, color white,
Weight per unit area approx. 46 g/m²,
Freely suspended sample arrangement,
Samples from longitudinal direction;

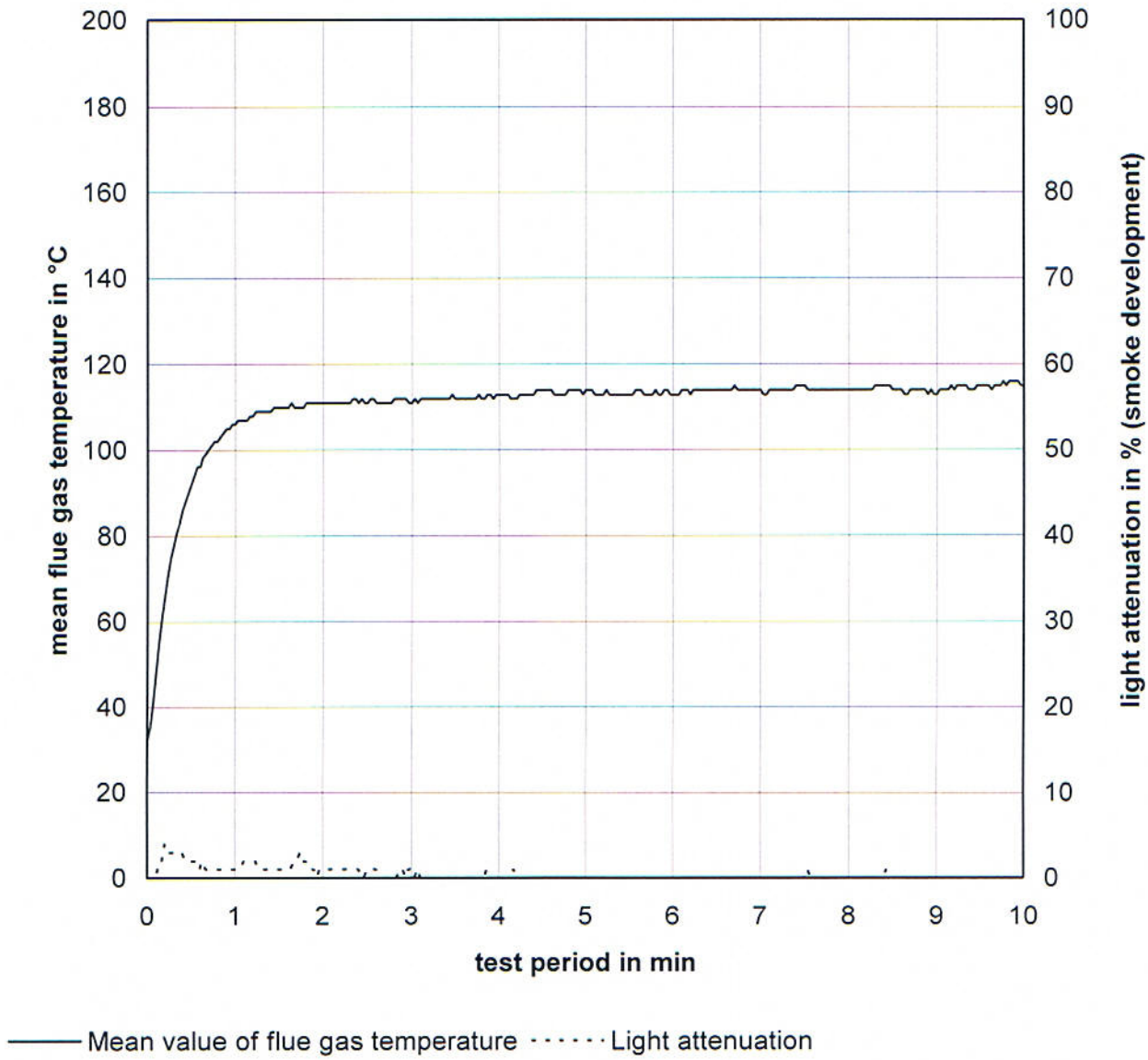
Maximum of mean flue gas temperature: 120 °C after 9:22 min:s
Surface integral of smoke density: < 1 %min



Flue gas temperature and smike development
Fire shaft test on 08/04.2011

Specimen D: Knitted fabric of polyester 3153FR, color white,
Weight per unit area approx. 277 g/m²,
Freely suspended sample arrangement,
Samples from transverse direction;

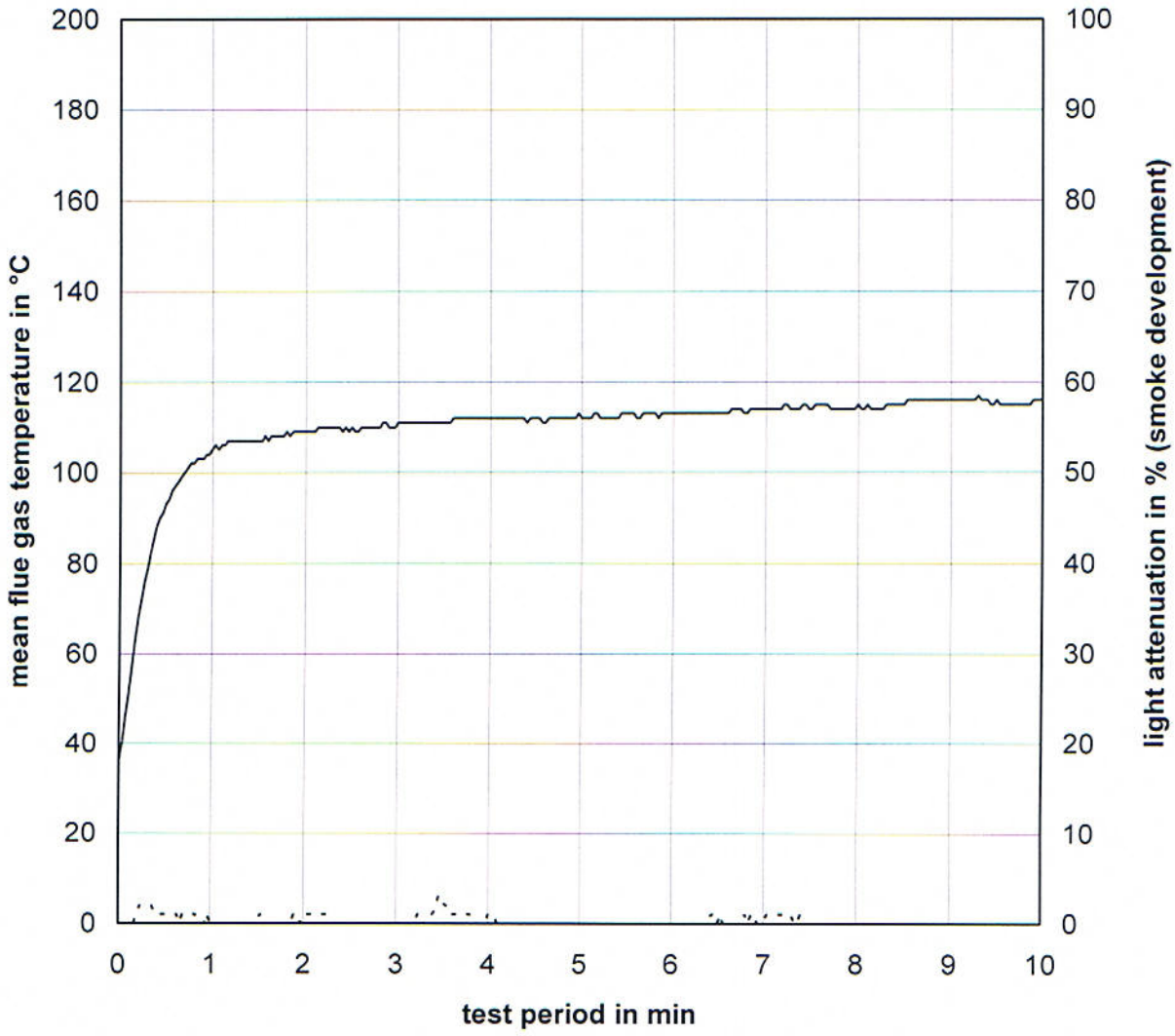
Maximum of mean flue gas temperature: 116 °C after 9:46 min:s
Surface integral of smoke density: 4 %min



Flue gas temperatures and smoke development
Fire shaft test on 08/04/2011

Specimen E: Woven fabric of polyester 6083FR, color white,
Weight per unit area approx. 345 g/m²,
Freely suspended sample arrangement,
Samples from longitudinal direction;

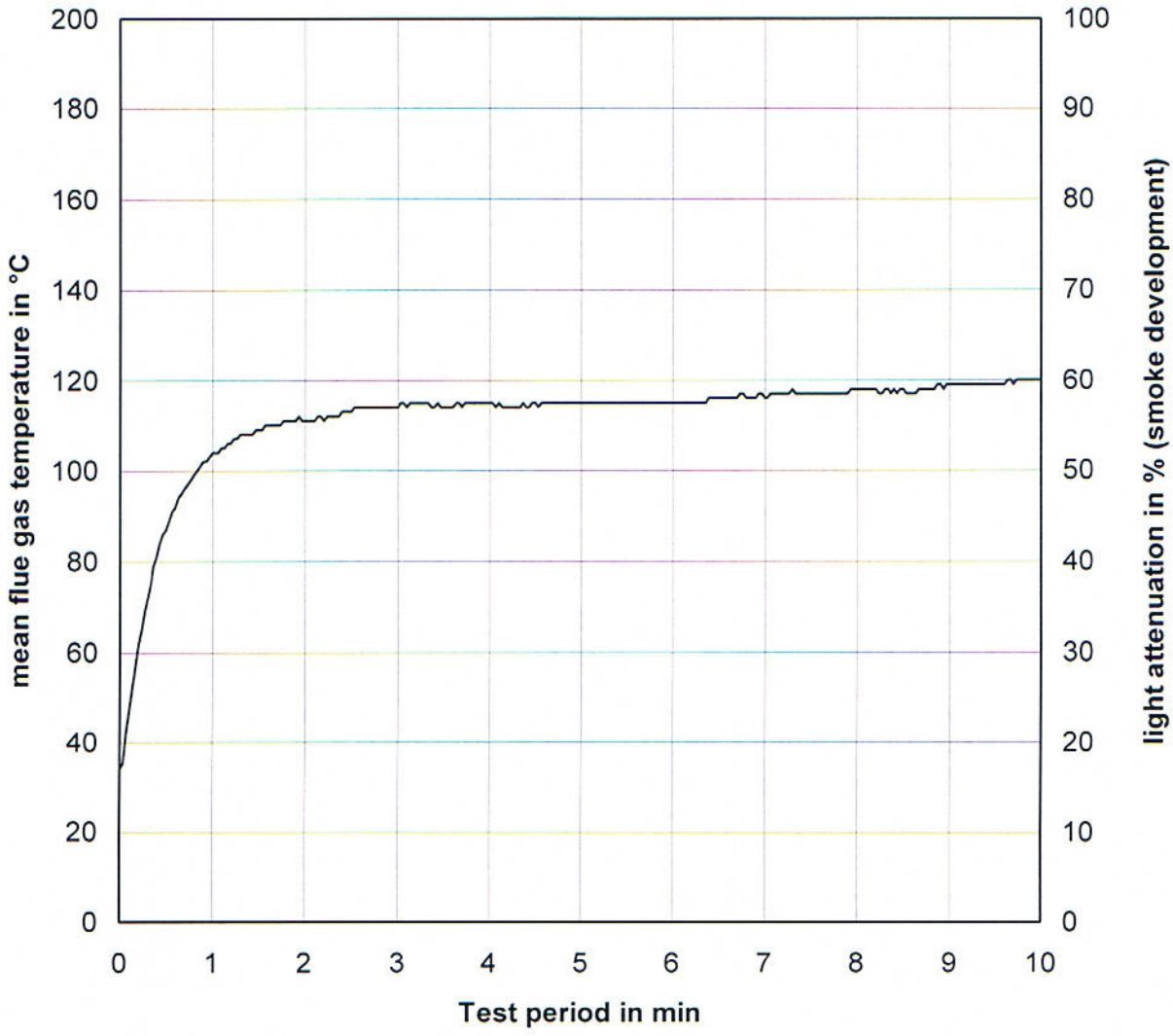
Maximum of mean flue gas temperature: 117 °C after 9:18 min:s
Surface integral of smoke density: 3 %min



Flue gas temperatures and smoke development
Fire shaft test on 20/04/2011

Specimen F: Knitted fabric of polyester 2187FR, color white,
Weight per unit area approx. 46 g/m²,
Freely suspended sample arrangement,
Samples from transverse direction;

Maximum of mean flue gas temperature: 120 °C after 9:38 min:s
Surface integral of smoke density: < 1 %min

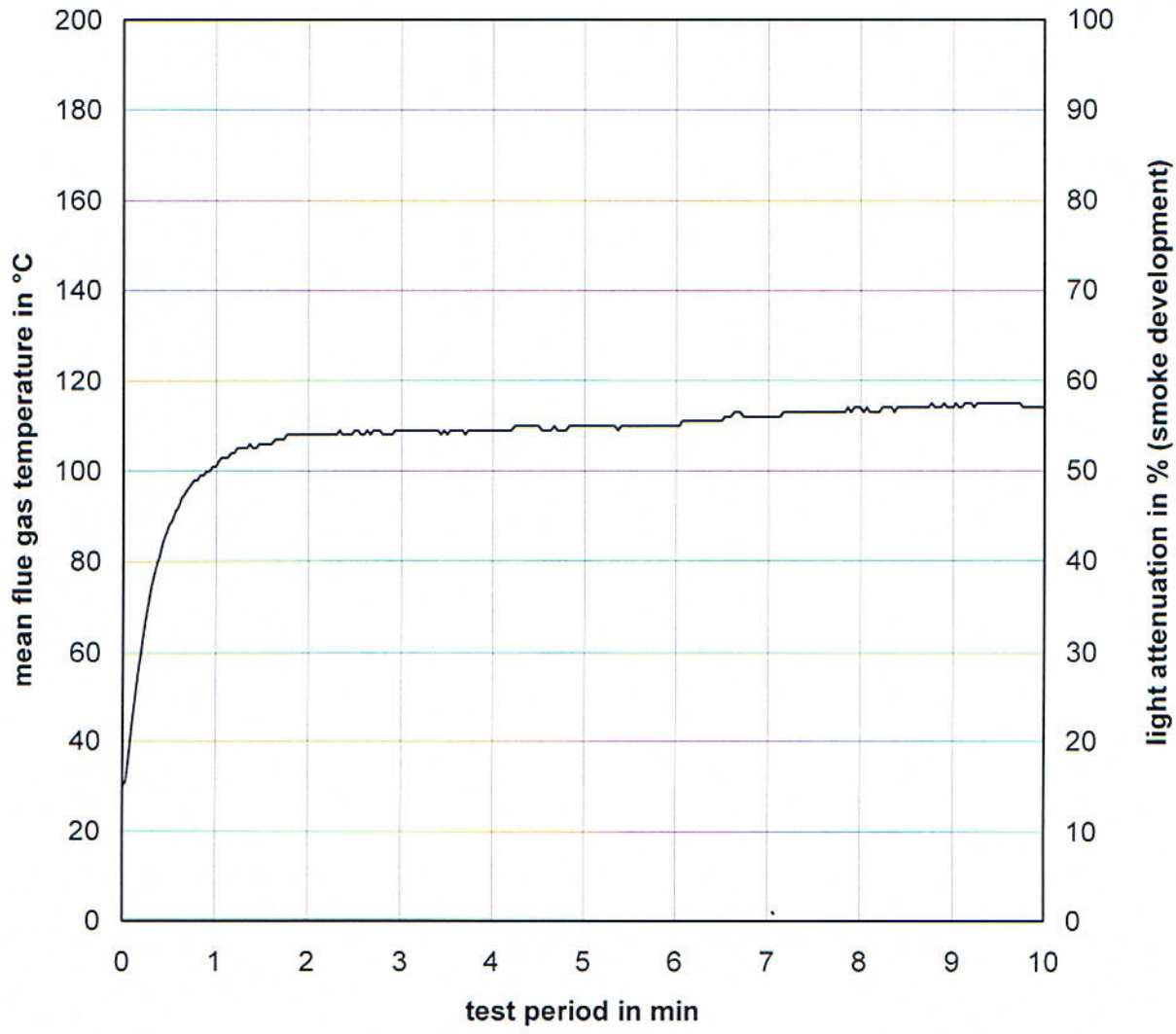


——— Mean value of flue gas temperature ····· Light attenuation

Flue gas temperatures and smoke development
Fire shaft test on 18/05/2011

Specimen G: Woven and/or knitted fabric of polyester 350FRn, color white
Weight per unit area approx. 112 g/m²,
Freely suspended sample arrangement,
Samples from longitudinal direction;

Maximum of mean flue gas temperaturer: 115 °C after 8:46 min:s
Surface integral of smoke density: < 1 %min



Flue gas temperatures and smoke development
Fire shaft test on 18/05/2011

Specimen H: Woven and/or knitted fabric of polyester 3152FRn, color white
Weight per unit area approx. 205 g/m²,
Freely suspended sample arrangement,
Samples from longitudinal direction;

Maximum of mean flue gas temperature: 120 °C after 9:26 min:s
Surface integral of smoke density: 1 %min