MFPA Leipzig GmbH
Testing, Inspection and Certification Authority for
Construction Products and Construction Types
Leipzig Institute for Materials Research and Testing
Business Division III - Structural Fire Protection
Dipl.-Ing. Sebastian Hauswaldt
Work Group 3.1 - Fire Behaviour of Building Products
Nick Neumann, M.Sc.
Tel.: +49 (0) 341 - 6582-191
neumann@mfpa-leipzig.de

BUITINK TECHNOLOGY
Advanced Lightweight Structures

Classification Report No. KB 3.1/14-082-3

09 April 2014
No. Copy 1

Sponsor:	AGC Glass Co., LTD AGC Chemicals Shin-Marunouchi Building, 1-5-1 Marunouchi Chiyoda-ku, Tokyo 100-8405 Japan
Subject matter:	Classification of the fire behavior according to DIN EN 13501-1:2010
Product:	ETFE-film material "Fluon® ETFE film"
Order date:	March 03, 2014
Prepared by:	Nick Neumann, M.Sc.

This classification report consists of 4 sheets.

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-11021-01-00

Test laboratory accredited by DAkkS GmbH according to DIN EN ISO/IEC 17025. The accreditation only applies to the test methods listed in the certificate (in this document marked with *) which can be seen on www.mfpa-leipzig.de

Notified testing laboratories, inspection bodies and certification bodies recognized according to the Construction Products Law (NB 800) and the State Building Code (SAC 02).

Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH)

Head Office: Hans-Weigel-Str. 2b – 04319 Leipzig/Germany
Managing Director: Prof. Dr.-Ing. Frank Dehn
Comm. Register: Local Court Leipzig HRB 17719
VAT-ID: DE 813200649
Tel.: +49 (0) 341 - 6582-0
Fax: +49 (0) 341 - 6582-135

1 Details of classified product

1.1 General

According to the client, the product "Fluon® ETFE film" is defined as a plastic film material for indoor and outdoor use.
According to the client, the product is not subject to any harmonized European product standard.

1.2 Product description

The building product "Fluon® ETFE film" is described below.

According to the client, the building product to be classified is a clear and transparent plastic film material for indoor and outdoor use. Its application is architecture and buildings.

Parameters provided by the client:

Thickness of "80NJ 1550NT":	80 ± 4 µm
Thickness of "300NJ 1550NT":	300 ± 15 µm
Mass per unit area of "80NJ 1550NT":	140 ± 7 g/m²
Mass per unit area of "300NJ 1550NT":	525 ± 26 g/m²

2 Reports and results in support of this classification

2.1 Reports

Name of Laboratory	Name of sponsor	Report ref. no.	Test method
MFPA Leipzig GmbH	AGC Glass Co., LTD	PB 3.1/14-082-1 of 09/04/2014	DIN EN ISO 11925-2 Building Rule List Part 1 2013/2 issue, Annex 0.2.3
MFPA Leipzig GmbH	AGC Glass Co., LTD	PB 3.1/14-082-2 of 09/04/2014	DIN EN 13823

2.2 Results

Test method	Parameter	No. Tests	Results	
			Continuous parameters (mean value)	Compliance with parameters (Y/N)
DIN EN 13823	$FIGRA_{0.2\ MJ}$	3	0.0	(-)
	$FIGRA_{0.4\ MJ}$	3	0.0	(-)
	LFS < edge	3	(-)	Y
	THR_{600s} [MJ]	3	0.11	(-)
	SMOGRA [m^2/s^2]	3	0.0	(-)
	TSP_{600s} [m^2]	3	14	(-)
	Flaming droplets / particles	3	(-)	No flaming droplets / particles
DIN EN ISO 11925-2	$F_s \leq 150$ mm	12	(-)	Y
	Flaming droplets / particles	12	(-)	No flaming droplets / particles
	Ignition of filter paper	12	(-)	No ignition

(-) not applicable

3 Classification and field of application

3.1 Reference to classification

This classification has been carried out in accordance with DIN EN 13501-1:2010, sections 11 and 14.1.

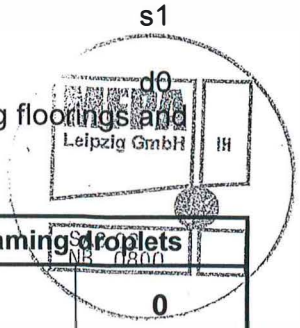
3.2 Classification

The product "Fluon® ETFE film" in relation to its reaction to fire behavior is classified B

The additional classification in relation to smoke production is: s1

The additional classification in relation to of flaming droplets / particles is: d0

The format of reaction to fire classification for construction products excluding floorings and linear pipe thermal insulation is:



Fire behavior		Smoke production			Flaming droplets	
B	-	s	1		d	0

i.e. **B-s1, d0**

Reaction to fire classification: B-s1, d0

3.3 Field of application

This classification is valid for the following product parameters:

- Nominal thickness: 80 – 300 µm
- Nominal weight per unit area: 140 – 525 g/m²
- Appearance: clear and transparent
- Composition: Ethylene-Tetrafluoroethylene copolymer

This classification is valid for the following end use applications:

- The building product may be mounted free-hanging with an air gap of ≥ 80 mm.
- The building product has to be fixed mechanically.

4 Limitations

4.1 In connection with other building products the fire behavior may be affected such that the classification in section 3.2 is no longer applicable. The fire behavior in connection with other building products or other bulk density ranges or thickness ranges shall be demonstrated separately.

4.2 This document shall not be deemed a type approval or product certification and shall not substitute a verification of applicability according to State building regulations, if any, as required under the provisions of the German building law (State building regulations).

4.3 This classification report shall be valid as long as the product composition and the product structure, respectively, the base materials or the production process and building regulations are not modified.

Leipzig, 09 April 2014

MFPA Leipzig GmbH
SAC 02
NB 0800

Dipl.-Ing. S. Hauswaldt	Dipl.-Ing. (FH) J. Dahncke	Nick Neumann, M.Sc.
Head of Business Division	*Head of Laboratory*	*Testing Engineer*

MFPA Leipzig GmbH
Testing, Inspection and Certification Authority for Construction Products and Construction Types
Leipzig Institute for Materials Research and Testing
Business Division III - Structural Fire Protection
Dipl.-Ing. Sebastian Hauswaldt
Work Group 3.1 - Fire Behaviour of Building Products
Nick Neumann, M.Sc.
Tel.: +49 (0) 341 - 6582-191
neumann@mfpa-leipzig.de

BUITINK TECHNOLOGY
Advanced Lightweight Structures

Test Report No. PB 3.1/14-082-2

as a basis for a classification report

09 April 2014

No. Copy 1

Sponsor:	AGC Glass Co., LTD AGC Chemicals Shin-Marunouchi Building, 1-5-1 Marunouchi Chiyoda-ku, Tokyo 100-8405 Japan
Subject matter:	Indicative fire testing according to SBI method (Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item) according to DIN EN 13823:2010-12*
Test item:	ETFE-film material "Fluon® ETFE film"
Date of order:	March 03, 2014
Samples received on:	March 11, 2014 (DZ 3.1/14-076)
Sampling:	By client
Identification:	"80NJ 1550NT" and "300NJ 1550NT"
Date of test:	April 07 and 08, 2014
Prepared by:	Nick Neumann, M.Sc.

This document consists of 3 pages and 2 enclosures with 10 pages.

DAkkS Deutsche Akkreditierungsstelle D-PL-11021-01-00

Test laboratory accredited by DAkkS GmbH according to DIN EN ISO/IEC 17025. The accreditation only applies to the test methods listed in the certificate (in this document marked with *) which can be seen on www.mfpa-leipzig.de

Notified testing laboratories, inspection bodies and certification bodies recognized according to the Construction Products Law (NB 800) and the State Building Code (SAC 02).

Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH)

Head Office: Hans-Weigel-Str. 2b – 04319 Leipzig/Germany
Managing Director: Prof. Dr.-Ing. Frank Dehn
Comm. Register: Local Court Leipzig HRB 17719
VAT-ID: DE 813200649
Tel.: +49 (0) 341 - 6582-0
Fax: +49 (0) 341 - 6582-135

1 Product description and application

According to the client, the product called "Fluon® ETFE film" is a clear and transparent plastic film material for indoor and outdoor use. Its application is architecture and buildings.

According to the client, this building product is not subject to a harmonized European product standard.

No further information about the building product was available to the test laboratory.

2 Material parameters

Parameters provided by the client:

Thickness of "80NJ 1550NT":	80 ± 4 µm
Thickness of "300NJ 1550NT":	300 ± 15 µm
Mass per unit area of "80NJ 1550NT":	140 ± 7 g/m^2
Mass per unit area of "300NJ 1550NT":	525 ± 26 g/m^2

MFPA Leipzig determined the following parameters.

Thickness of "80NJ 1550NT":	80 µm approximately
Thickness of "300NJ 1550NT":	300 µm approximately
Mass per unit area of "80NJ 1550NT":	140 g/m^2 approximately
Mass per unit area of "300NJ 1550NT":	542 g/m^2 approximately

3 Preparation of samples

The specimens were prepared by MFPA Leipzig GmbH. The product was cut into pieces having dimensions of 500 mm x 1500 mm and 1000 mm x 1500 mm. The product was fixed mechanically onto a steel frame with screws. The steel frame was in accordance with CEN/TS 15447:2006, Figure A.2a. The specimens were tested free-standing with a ventilated air gap of 80 mm. The panels in accordance with EN 13823:2010, 4.4.11 were removed.

Prior to the test, the specimens were conditioned according to DIN EN 13238.

4 Testing and test results

The tests were conducted according to DIN EN 13823:2010-12.
The results are shown in enclosure 1 and are summarized in the below tables. Photos are shown in enclosure 2.
The smoke production rate, *SPR*, of the burner was calculated using data from the auxiliary (secondary) burner.

Table 1: Test results of "300NJ 1550NT" in accordance with DIN EN 13823:2010-12

Sample	$FIGRA_{0,2\ MJ}$ [W/s]	$FIGRA_{0,4\ MJ}$ [W/s]	$THR_{600\ s}$ [MJ]	LFS	SMOGRA [m²/s²]	$TSP_{600\ s}$ [m²]	Burning droplets/ particles	Burning droplets/ particles > 10 s
DZ3.1/ 14-076A	0.0	0.0	0.20	no	0.0	18	no	no
DZ3.1/ 14-076C	0.0	0.0	0.11	no	0.0	14	no	no
DZ3.1/14-076D	0.0	0.0	0.17	no	0.0	11	no	no
Average	**0.0**	**0.0**	**0.16**	**no**	**0.0**	**14**	**no**	**no**

Table 2: Test results of "80NJ 1550NT" in accordance with DIN EN 13823:2010-12

Sample	$FIGRA_{0,2\ MJ}$ [W/s]	$FIGRA_{0,4\ MJ}$ [W/s]	$THR_{600\ s}$ [MJ]	LFS	SMOGRA [m²/s²]	$TSP_{600\ s}$ [m²]	Burning droplets/ particles	Burning droplets/ particles > 10 s
DZ3.1/ 14-076B	0.0	0.0	0.11	no	0.0	14	no	no

5 Notes

This test report is the basis for the required verification of applicability.

This test report does not substitute the general appraisal certificate. But it is the basis for a general appraisal certificate.

This test report is not a verification of applicability with regard to the German building regulations (State building regulation/ national building law).

This test report can be used as a basis for classification according to DIN EN 13501-1.

The test results relate to the behaviour of the test specimen of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

The results of the tests exclusively refer to the described test objects but not to the main unit. This document does not replace a certificate of conformity or suitability according to national and European building codes.

Leipzig, 09 April 2014

MFPA Leipzig GmbH
CAC 02
NB 0800

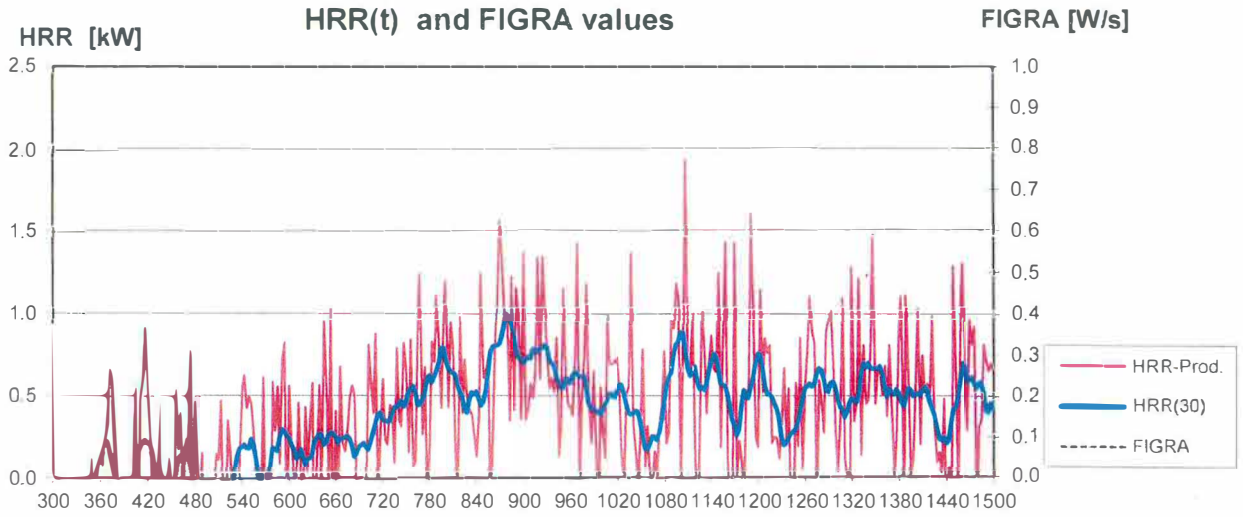
Dipl.-Ing. S. Hauswaldt	Dipl.-Ing. (FH) J. Dahncke	Nick Neumann, M.Sc.
Head of Business Division	*Head of Laboratory*	*Testing Engineer*

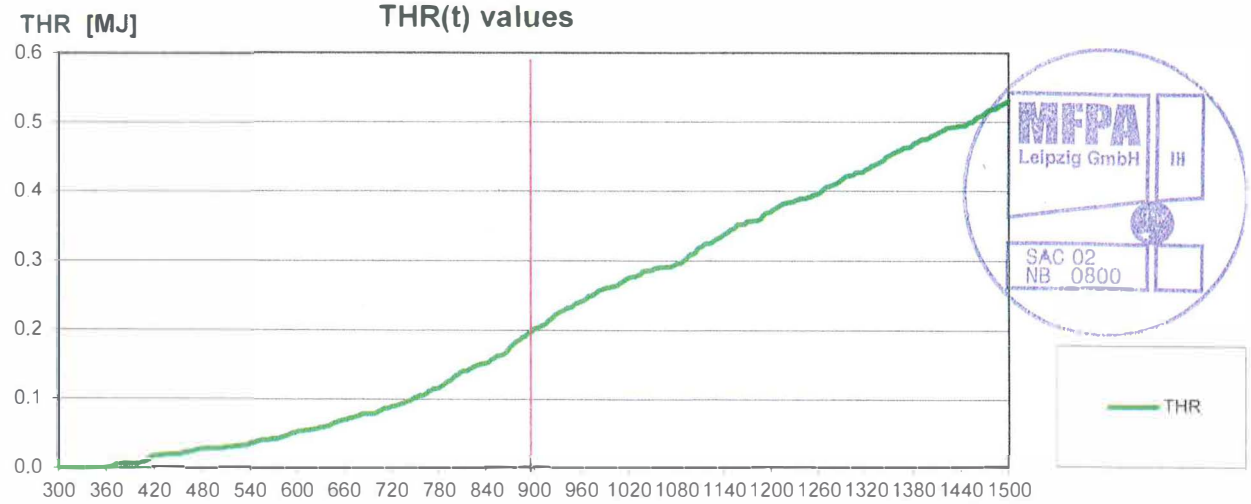
Graphs and results of the SBI test

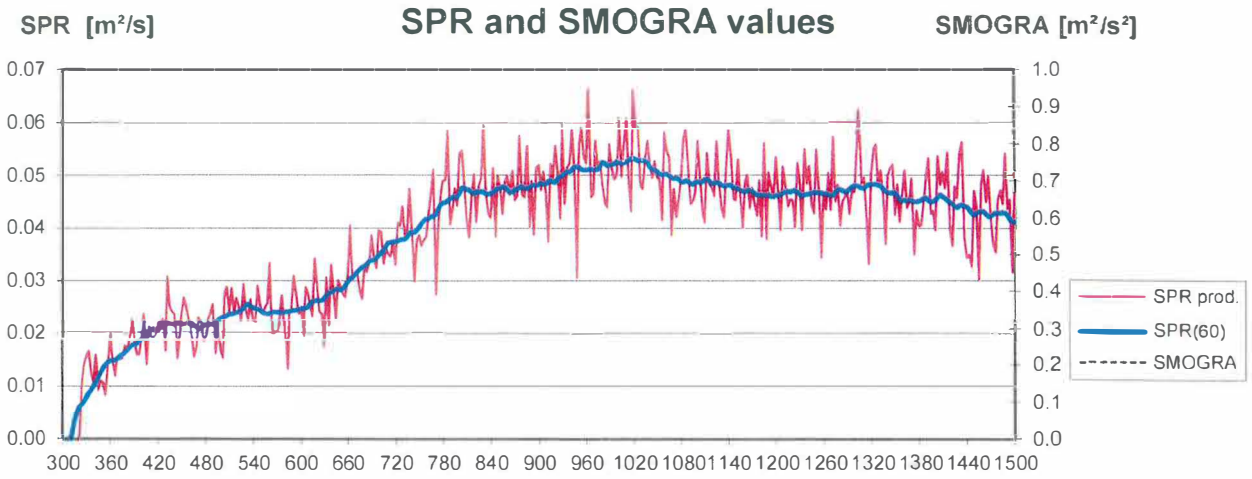
Date of test: 07.04.2014

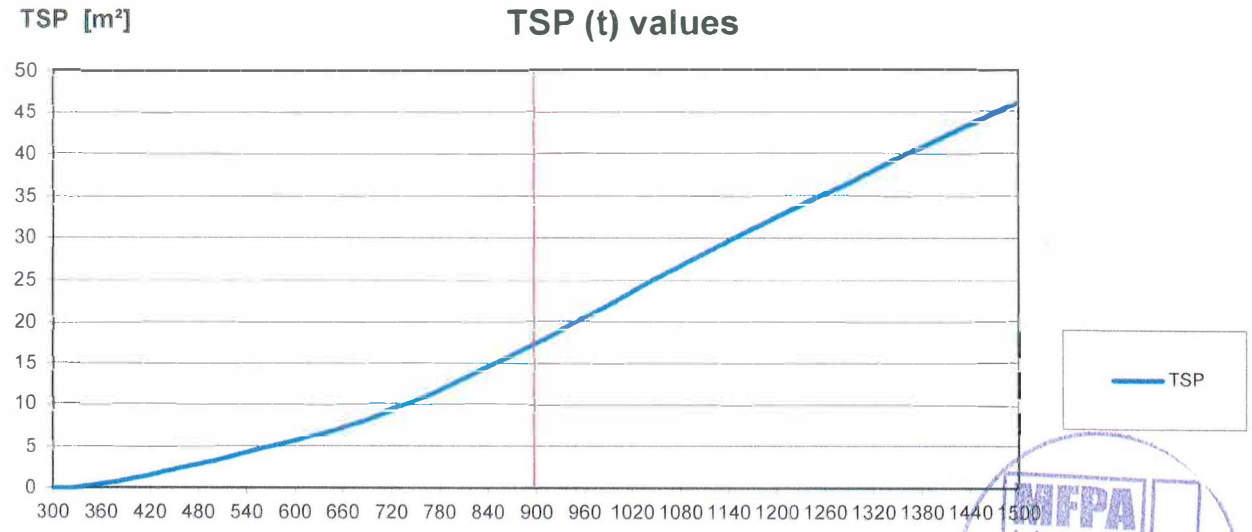
Sample: ETFE-film material (300 µm)
DZ14076A

Test terminated after [s]:	no
FIGRA$_{0,2\ MJ}$ [W/s]:	0.0
FIGRA$_{0,4\ MJ}$ [W/s]:	0.0
THR$_{600}$ [MJ]:	0.20
LFS:	0
SMOGRA [m²/s²]:	0.0
TSP$_{600}$ [m²]:	17.5
Flaming particles/ droplets:	N
Flaming particles/ droplets > 10 s:	N









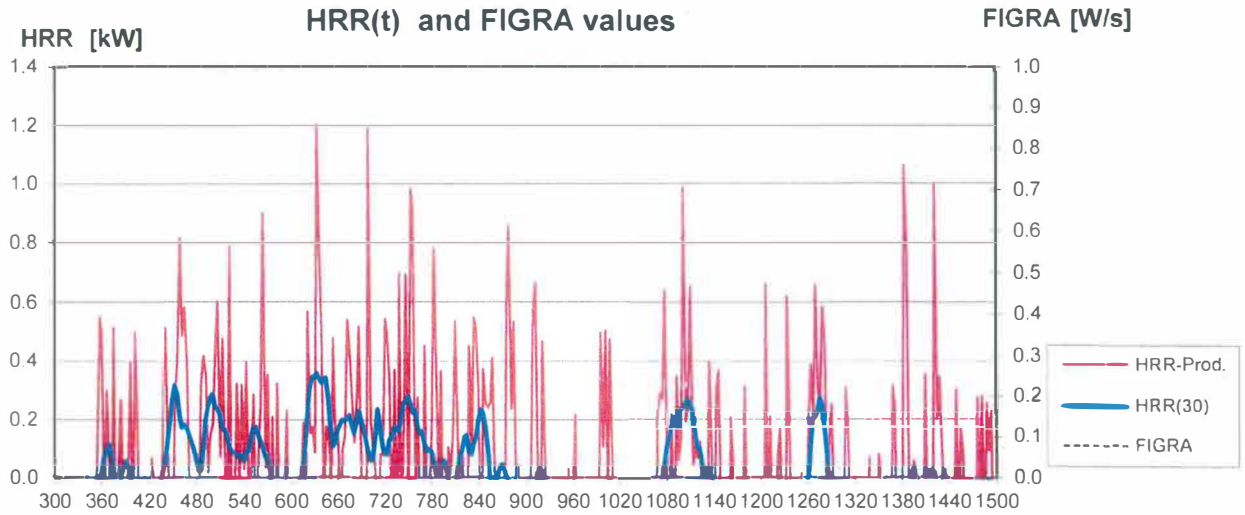
MFPA Leipzig GmbH
SAC 02
NB 0800

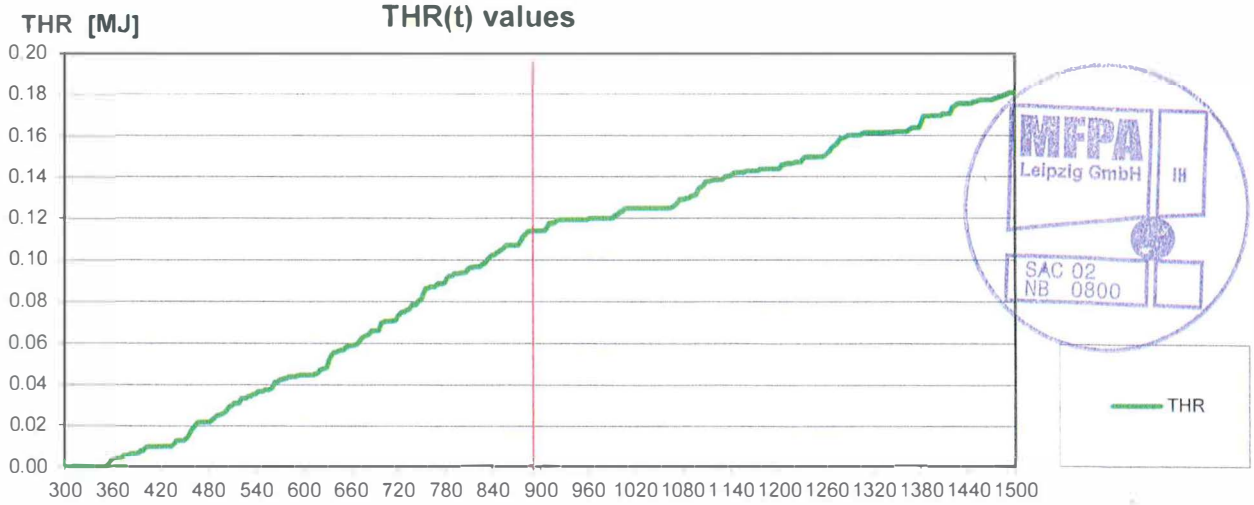
Graphs and results of the SBI test

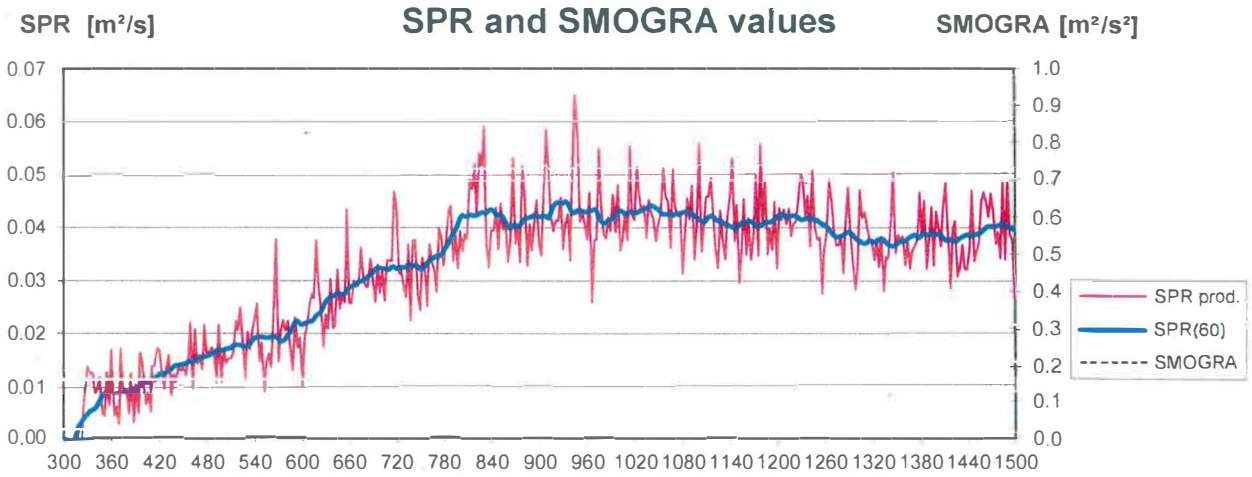
Date of test: 08.04.2014

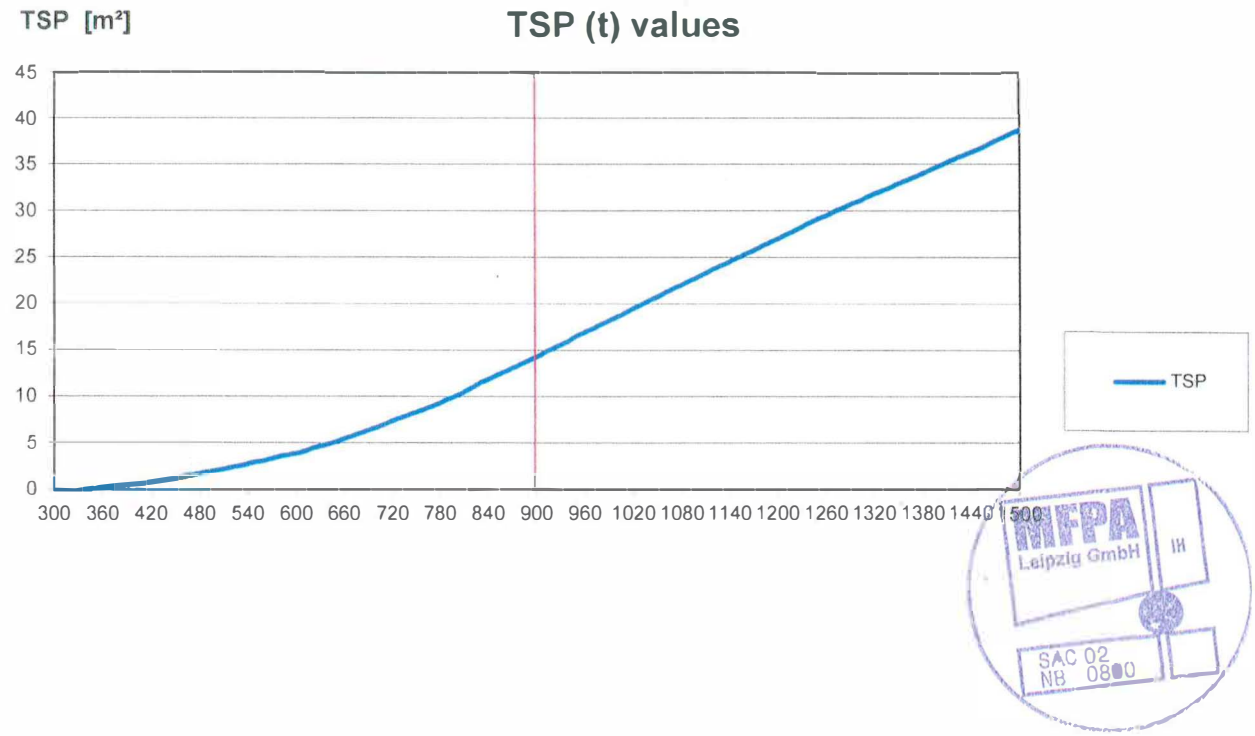
Sample: ETFE-film material (300 µm)
DZ14076C

Test terminated after [s]:	no
$FIGRA_{0,2\ MJ}$ [W/s]:	0.0
$FIGRA_{0,4\ MJ}$ [W/s]:	0.0
THR_{600} [MJ]:	0.11
LFS:	0
SMOGRA [m²/s²]:	0.0
TSP_{600} [m²]:	14.3
Flaming particles/ droplets:	N
Flaming particles/ droplets > 10 s:	N









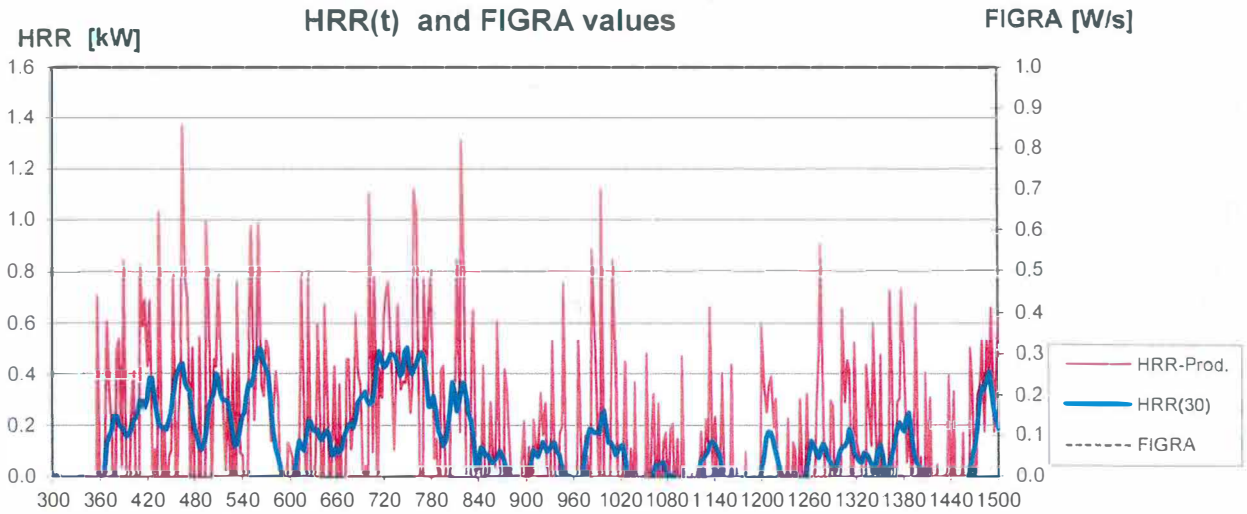
MFPA Leipzig GmbH
SAC 02
NB 0800

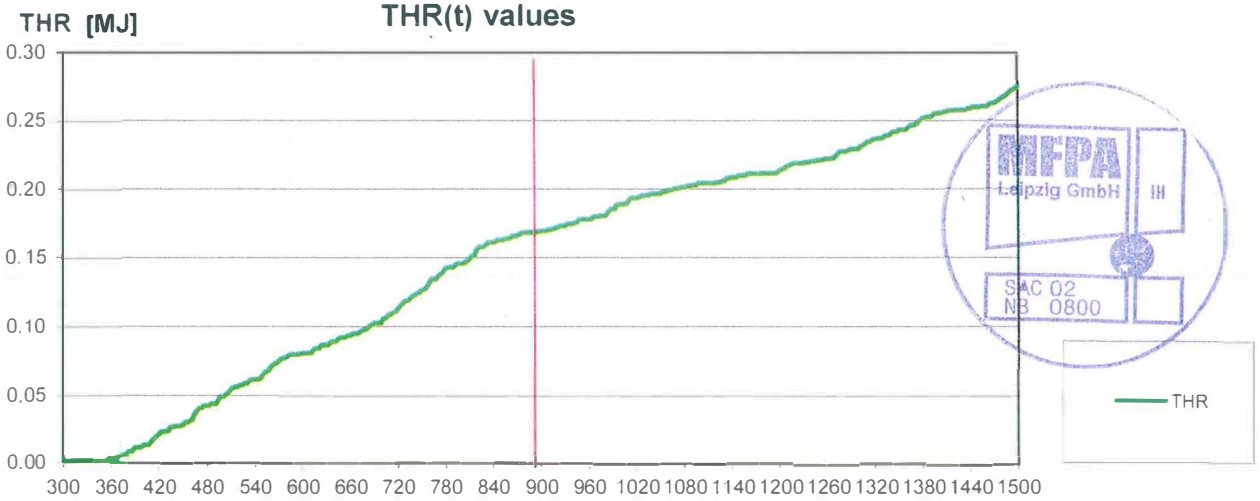
Graphs and results of the SBI test

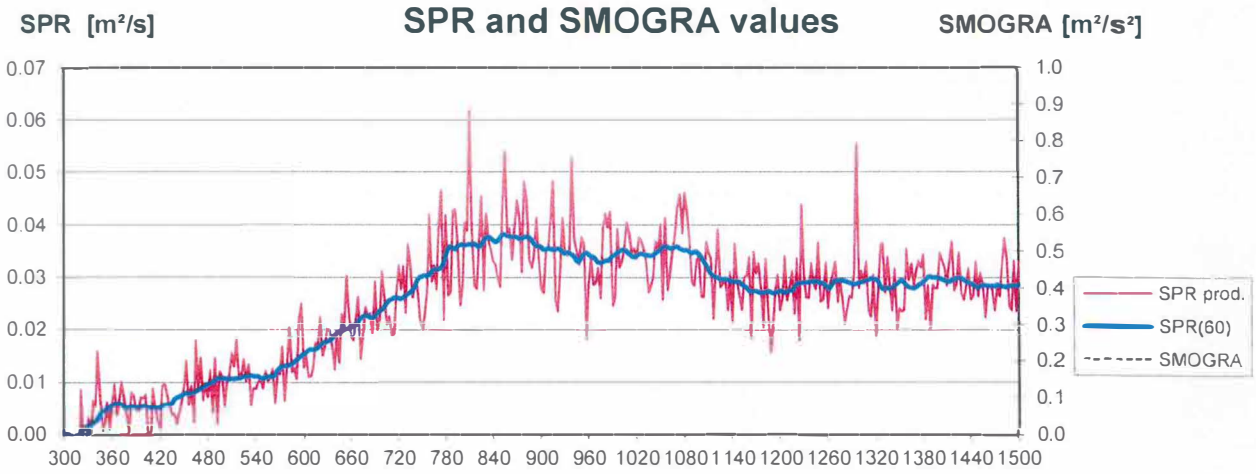
Date of test:: 08.04.2014

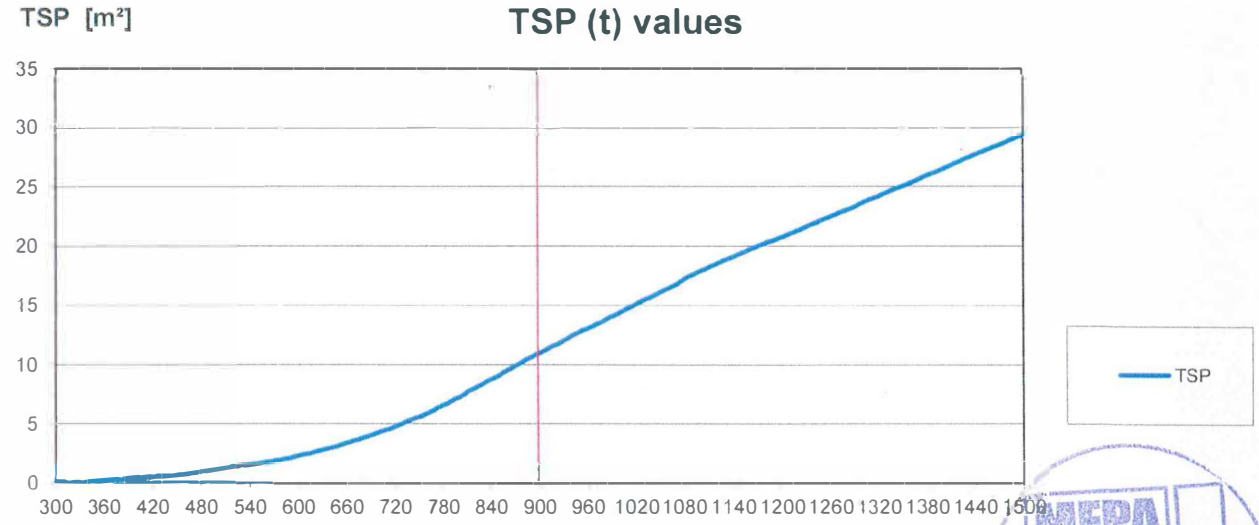
Sample: ETFE-film material (300 µm)
DZ14076D

Test terminated after [s]:	nein
FIGRA$_{0,2\ MJ}$ [W/s]:	0.0
FIGRA$_{0,4\ MJ}$ [W/s]:	0.0
THR$_{600}$ [MJ]:	0.17
LFS:	0
SMOGRA [m²/s²]:	0.0
TSP$_{600}$ [m²]:	11.0
Flaming particles/ droplets:	N
Flaming particles/ droplets > 10 s:	N









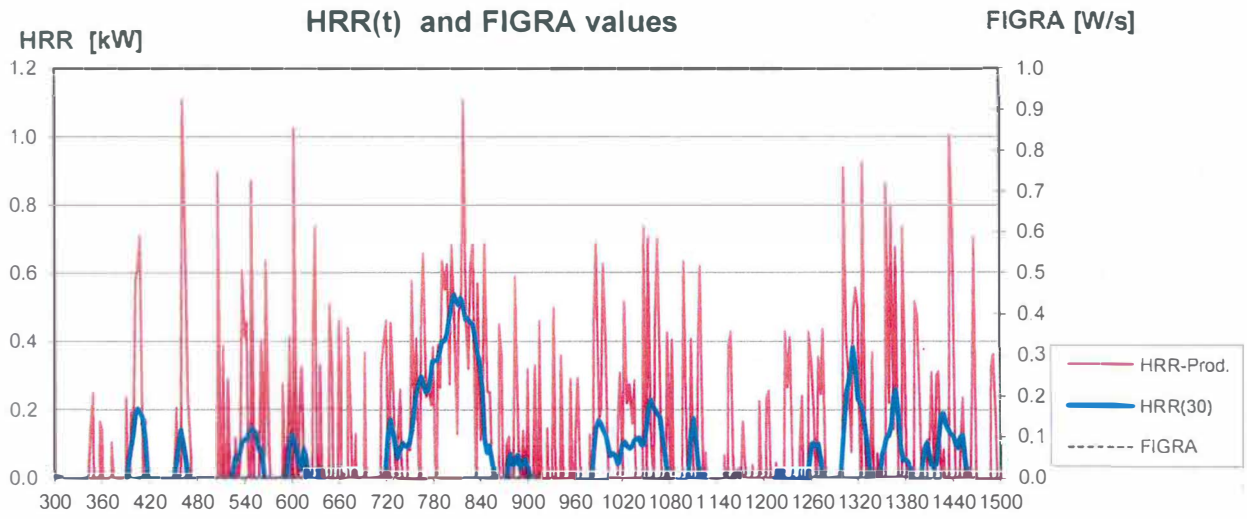
MFPA Leipzig GmbH
SAC 02
NB 0800

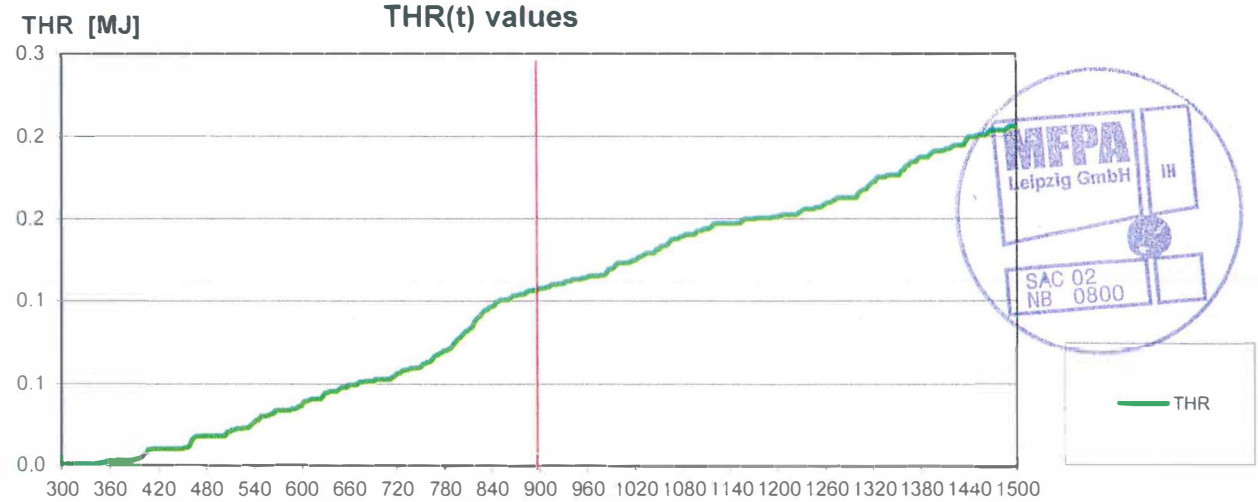
Graphs and results of the SBI test

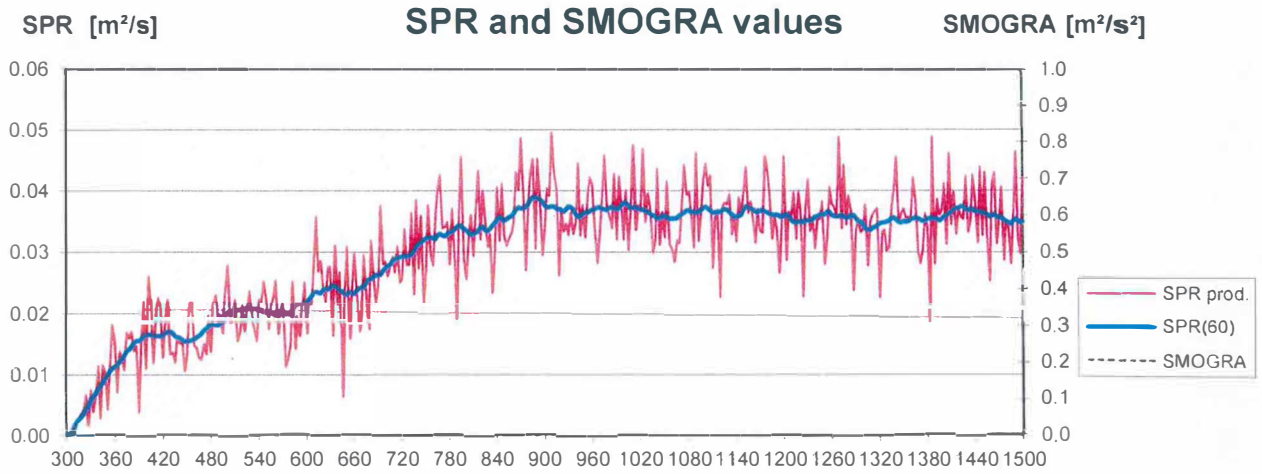
Date of test: 07.04.2014

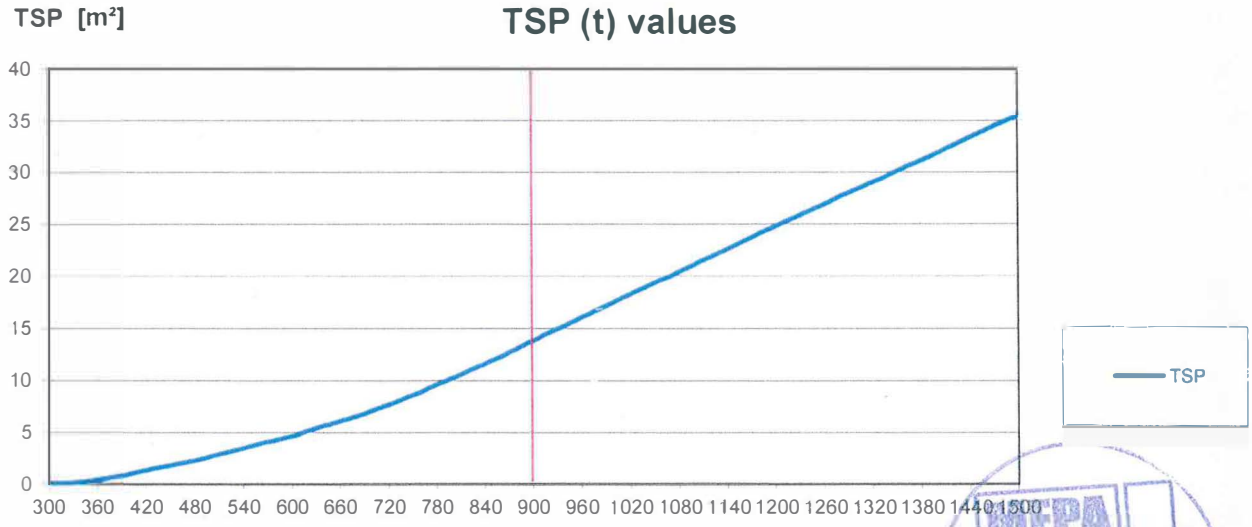
Sample: ETFE-film material (80 µm)
DZ14076B

Test terminated after [s]:	no
FIGRA$_{0,2\ MJ}$ [W/s]:	0.0
FIGRA$_{0,4\ MJ}$ [W/s]:	0.0
THR$_{600}$ [MJ]:	0.11
LFS:	0
SMOGRA [m²/s²]:	0.0
TSP$_{600}$ [m²]:	13.8
Flaming particles/ droplets:	N
Flaming particles/ droplets > 10 s:	N









MFPA Leipzig GmbH
SAC 02
NB 0800

Photo no 1: Specimen A ("Fluon® ETFE film 300NJ 1550NT"). Prior to test, the exposed surface of the long wing.

Photo no 2: Specimen A ("Fluon® ETFE film 300NJ 1550NT"). Prior to test, the vertical outer edge of the long wing at a height of 500 mm above the floor of the trolley.

Photo no 3: Specimen A ("Fluon® ETFE film 300NJ 1550NT"). After test, impact of flames in the burner corner.

Photo no 4: Specimen B ("Fluon® ETFE film 80NJ 1550NT"). Prior to test, the exposed surface of the long wing.

Photo no 5: Specimen B ("Fluon® ETFE film 80NJ 1550NT"). Prior to test, the vertical outer edge of the long wing at a height of 500 mm above the floor of the trolley.

Photo no 6: Specimen B ("Fluon® ETFE film 80NJ 1550NT"). After test, impact of flames in the burner corner.

MFPA Leipzig GmbH
Testing, Inspection and Certification Authority for
Construction Products and Construction Types

Leipzig Institute for Materials Research and Testing
Business Division III - Structural Fire Protection
Dipl.-Ing. Sebastian Hauswaldt

Work Group 3.1 - Fire Behaviour of Building Products
Nick Neumann, M.Sc.
Tel.: +49 (0) 341 - 6582-191
neumann@mfpa-leipzig.de

BUITINK TECHNOLOGY
Advanced Lightweight Structures

Test Report No. PB 3.1/14-082-1

as a basis for a classification report

09 April 2014

No. Copy 1

Sponsor:	AGC Glass Co., LTD AGC Chemicals Shin-Marunouchi Building, 1-5-1 Marunouchi Chiyoda-ku, Tokyo 100-8405 Japan
Subject matter:	Test of the fire behavior of building products, inflammability at direct flame attack according to DIN EN ISO 11925-2:2011-02*
Object:	ETFE-film material "Fluon® ETFE film"
Order date:	March 03, 2014
Samples received on:	March 11, 2014 (DZ 3.1/14-076)
Sampling:	by client
Identification:	"80NJ 1550NT" and "300NJ 1550NT"
Test date:	April 07, 2014
Prepared by:	Nick Neumann, M.Sc.

This document consists of 5 sheets.

ilac-MRA DAkkS Deutsche Akkreditierungsstelle D-PL-11021-01-00

Test laboratory accredited by DAkkS GmbH according to DIN EN ISO/IEC 17025. The accreditation only applies to the test methods listed in the certificate (in this document marked with *) which can be seen on www.mfpa-leipzig.de

Notified testing laboratories, inspection bodies and certification bodies recognized according to the Construction Products Law (NB 800) and the State Building Code (SAC 02).

Gesellschaft für Materialforschung und Prüfungsanstalt für das Bauwesen Leipzig mbH (MFPA Leipzig GmbH)

Head Office: Hans-Weigel-Str. 2b – 04319 Leipzig/Germany
Managing Director: Prof. Dr.-Ing. Frank Dehn
Comm. Register: Local Court Leipzig HRB 17719
VAT-ID: DE 813200649
Tel.: +49 (0) 341 - 6582-0
Fax: +49 (0) 341 - 6582-135

1 Product description and application

According to the client, the product called "Fluon® ETFE film" is a clear and transparent plastic film material for indoor and outdoor use. Its application is architecture and buildings.

According to the client, this building product is not subject to a harmonized European product standard.

No further information about the building product was available to the test laboratory.

2 Material parameters

Parameters provided by the client:

Thickness of "80NJ 1550NT":	80 ± 4 µm
Thickness of "300NJ 1550NT":	300 ± 15 µm
Mass per unit area of "80NJ 1550NT":	140 ± 7 g/m²
Mass per unit area of "300NJ 1550NT":	525 ± 26 g/m²

MFPA Leipzig determined the following parameters.

Thickness of "80NJ 1550NT":	80 µm approximately
Thickness of "300NJ 1550NT":	300 µm approximately
Mass per unit area of "80NJ 1550NT":	140 g/m² approximately
Mass per unit area of "300NJ 1550NT":	542 g/m² approximately

3 Preparation of samples

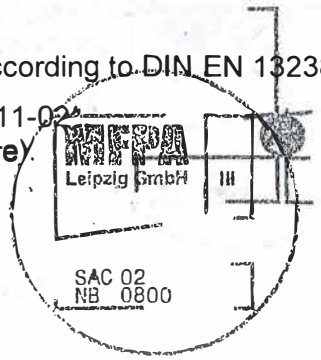
The material was provided by the client. The samples were prepared by MFPA Leipzig GmbH and had the dimensions 250 mm x 90 mm x thickness mm.

4 Testing

Prior to the test, the samples and the filter paper were conditioned according to DIN EN 13238.

The test was carried out in accordance with DIN EN ISO 11925-2:2011-02, section 7.3.3.1 (surface exposure) and section 7.3.3.2 (edge exposure).

The flaming period was 30 s.
The samples were tested free-hanging.



5 Test results

Description of the test setup for "Fluon® ETFE film 80 NJ 1550NT"
and "Fluon® ETFE film 300 NJ 1550NT"

Table 1: Fire tests according to DIN EN ISO 11925-2, section 7.3.3.2 (edge exposure)

"Fluon® ETFE film 300 NJ 1550NT"

Thickness: ca. 300 µm, mass per unit area: ca. 542 g/m², colour: transparent,

The samples were tested free-hanging.

Sample 1, 3 and 5: edge exposure, lengthwise to production direction.

Sample 2, 4 and 6: edge exposure, crosswise to production direction.

Data acc. to DIN EN ISO 11925-2		Test results Sample No.					
		1	2	3	4	5	6
Ignition	[s]	1	1	1	1	1	1
Maximum flame height	[mm]	80	70	70	50	70	80
Time of occurrence	[s]	16	10	13	6	12	10
Flame peak at measuring mark	[s]	./.	./.	./.	./.	./.	./.
Extinguishing of flame before reaching the measuring mark	[s]	26	23	17	14	20	34
Continued burning after end of test	[s]	./.	./.	./.	./.	./.	./.
Ignition of filter paper	[s]	./.	./.	./.	./.	./.	./.
Specific observations:		Flaming droplets / particles as well as ignition of filter paper did not occur.					
Smoke development (visual):		low moderate strong very strong					

./. event did not occur

MFPA Leipzig GmbH
SAC 02
NB 0800

Table 2: Fire tests according to DIN EN ISO 11925-2, section 7.3.3.1 (surface exposure) and section 7.3.3.2 (edge exposure)

"Fluon® ETFE film 80 NJ 1550NT" and "Fluon® ETFE film 300 NJ 1550NT"

Thickness: ca. 80 µm and ca. 300 µm, mass per unit area: ca. 140 g/m² and ca. 542 g/m², colour: transparent,

The samples were tested free-hanging.

Sample 1: "Fluon® ETFE film 80 NJ 1550NT", edge exposure, lengthwise to production direction

Sample 2: "Fluon® ETFE film 80 NJ 1550NT", edge exposure, crosswise to production direction

Sample 3: "Fluon® ETFE film 80 NJ 1550NT", surface exposure, lengthwise to production direction

Sample 4: "Fluon® ETFE film 80 NJ 1550NT", surface exposure, crosswise to production direction

Sample 5: "Fluon® ETFE film 300 NJ 1550NT", surface exposure, lengthwise to production direction

Sample 6: "Fluon® ETFE film 300 NJ 1550NT", surface exposure, crosswise to production direction

Data acc. to DIN EN ISO 11925-2		Test results Sample No. 1	2	3	4	5	6
Ignition	[s]	1	2	3	3	10	12
Maximum flame height	[mm]	60	50	30	40	30	50
Time of occurrence	[s]	3	5	4	5	17	31
Flame peak at measuring mark	[s]	./.	./.	./.	./.	./.	./.
Extinguishing of flame before reaching the measuring mark	[s]	4	7	5	6	31	32
Continued burning after end of test	[s]	./.	./.	./.	./.	./.	./.
Ignition of filter paper	[s]	./.	./.	./.	./.	./.	./.
Specific observations:		Flaming droplets / particles as well as ignition of filter paper did not occur.					
Smoke development (visual):		low	moderate	strong	very strong		

./. event did not occur

MFPA Leipzig GmbH
SAC 02
NB 0800

6 Notes

The test results shall not be deemed verification for the classification of the building products in a class according to DIN EN 13501-1.

This test report can be used as a basis for classification according to DIN EN 13501-1.

The test results relate to the behaviour of the test specimen of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

The fire behaviour may change in connection with other materials.

The results of the tests exclusively refer to the described test objects but not to the main unit. This document does not replace a certificate of conformity or suitability according to national and European building codes.

Leipzig, 09 April 2014

MFPA Leipzig GmbH SAC 02 NB 0800

Dipl.-Ing. S. Hauswald	Dipl.-Ing. (FH) J. Dahncke	Nick Neumann, M.Sc.
Head of Business Division	*Head of Laboratory*	*Testing Engineer*