LNE
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LABORATOIRE DE TRAPPES
29 avenue Roger Hennequin – 78197 Trappes Cedex
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TEST REPORT

Sponsor :	NORRES SCHLAUTECHNIK GmbH & Co.KG Am Stadthafen 12-18 45881 GELSENKIRCHEN GERMANY
Reference of order :	Mail dated on the April 20th, 2011
Test specification :	Test of fire reaction for F classification
Specification document :	Standard NF F 16-101 (October 1988) Standard NF F 16-102 (April 1992) STM-S-001 Index C (October 2006)
Material trademark :	AIR DUC PUR 352 SE
Identification of samples :	Fire-retarded polyurethane profiled hose, reinforced with a steel wire spiral, transparent coloured and about 0,85 mm thick
Tested face :	Profiled face
Description of samples :	page 2

CLASSIFICATION : F2

This classification has been specified according to the above mentioned standards from analysis of the gases generated by the combustion and smoke opacity, the results of which are in appendices 1 and 2.

The mentionned results are only applicable to the samples, products or materials submitted to LNE, such as they are defined in this document.

Trappes, the June 23th, 2011

The Head of Fire Behaviour and Fire Safety Department

Valérie RUMBAU

Laboratoire national de métrologie et d'essais • LNE

Test officer
Michael DE ABREU

Responsible for test

Luc NOBLANC

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1. IDENTIFICATION OF SAMPLES

The applicant supplied on the May 6th, 2011 to the LABORATOIRE NATIONAL DE METROLOGIE ET D'ESSAIS samples referenced "AIRDUC PUR 352 SE" and gave the following informations.

Manufacturer :	NORRES SCHLAUTECHNIK GmbH & Co.KG Am Stadthafen 12-18 45881 GELSENKIRCHEN GERMANY
Composition :	Polyurethane + steel wire
Colour :	Transparent
Tested thickness :	0,85 mm
Mass :	About 2,95 kg/m² (determined by LNE)
End use :	Hoses.

Tests have been carried out from the May 26th, 2011 to the June 9th, 2011.

2. DETERMINATION OF F CLASSIFICATION

The materials are classified from F0 to F5 according to the value of smoke index called I.F.

$$I.F. = \frac{Dmax}{100} + \frac{VOF4}{30} + \frac{I.T.C.}{2}$$

Clt.F	I.F.
F0	I.F. ≤ 5
F1	I.F. ≤ 20
F2	I.F. ≤ 40
F3	I.F. ≤ 80
F4	I.F. ≤120
F5	I.F. >120

Dmax : maximum specific optical density determinated with the average of 3 tests whose results are given in appendix 2.

VOF4 : smoke obscuration value during the first 4 minutes determinated with the average of 3 tests whose results are given in appendix 2.

I.T.C. : conventional toxicity index determinated with the concentration of the different gases to the average of 3 tests whose results are given in appendix 1.

Result of the measurements

$$I.F. = \frac{340.93}{100} + \frac{742.10}{30} + \frac{17.75}{2}$$

I.F. = 37 therefore **F2 Class**

APPENDIX 1

TOXIC GAS SPECIES ANALYSIS

- TESTS PROCEDURE

The tests have been carried out in a tubular furnace at 600°C on a sample of about 1 g of combustible mass, according to the NF X 70-100 standard (April 2006). Each representative piece has been cut in the thickness of the material.

- Carbon monoxide and carbon dioxide (CO et CO_2), are systematically measured in continuous by non dispersive infra-red spectrophotometry.
- Fluoride ion has been researched by ion liquid chromatography (qualitative analysis). According to the result, hydrogen fluoride (HF) is measured by ionometry.

Moreover, a preliminary analysis has been conducted. According to the results, the gases analysed are :

- Hydrogen chloride (HCl), hydrogen bromide (HBr), sulfur dioxide (SO_2), measured by ion liquid chromatography.
- Hydrogen cyanide (HCN), measured by visible spectrophotometry.

- RESULTS

The ignition occurred at about 1 min and the extinguishing at about 2 min.
The mass loss is 100 %.

	Test n°1	Test n°2	Test n°3	Mean value
CO (mg/g)	89.03	96.96	87.88	**91.29**
CO_2 (mg/g)	404.01	409.91	405.88	**406.60**
HBr (mg/g)	N.M.	/	/	**N.M.**
HCl (mg/g)	N.M.	/	/	**N.M.**
HCN (mg/g)	6.91	6.62	6.41	**6.65**
SO_2 (mg/g)	N.M.	/	/	**N.M.**
HF (mg/g)	N.Det.	/	/	**N.Det.**

N.M. : Not Measurable
N.Det. : Not Detected during the qualitative analysis

DETERMINATION OF CONVENTIONAL TOXICITY INDEX

$$I.T.C = 100 \times \sum \frac{ti}{cci}$$

with ti = average contents of the "i" gas generated

cci = critical concentration of the "i" gas

$$I.T.C. = 100 \times \left[\frac{91.29}{1750} + \frac{406.60}{90000} + \frac{6.65}{55} \right]$$

I.T.C. = 17.75

APPENDIX 2

SMOKE OPACITY MEASUREMENT

- TESTS PROCEDURE

The tests have been carried out in a smoke chamber according to the specification of the standard NF X 10-702 Part 1 (November 1995) and Parts 2 to 5 (September 1994).

A preliminary test is carried out : one without pilot flames and one with pilot flames. According to the application document STM-S-001 index C (October 2006), the highest partial smoke index ($IF_{partiel}$ = VOF4/30 + Dmax/100) determines the exposure mode for the 2 following tests. In case any of the $IF_{partiel}$ is lower than the $IF_{partiel}$ of the initially not chosen mode, 2 complementary tests are carried out in that mode. Then, the finally chosen mode is the mode leading to the highest mean value for the 3 $IF_{partiels}$.

- RESULTS

For the test without pilot flames,
VOF4 = 95.0 , Dmax = 271.9 and $IF_{partiel}$ = 5.89
For the test with pilot flames,
VOF4 = 857.3 , Dmax = 393.6 and $IF_{partiel}$ = 32.52

Consequently, the tests have been carried out with pilot flames.
The results and curves obtained for each test are given in appendix 3.

	Test n°1	Test n°2	Test n°3	Mean Value
VOF4	857.3	699.8	669.2	**742.10**
Dmax	393.6	314.3	314.9	**340.93**

- OBSERVATIONS DURING THE TESTS

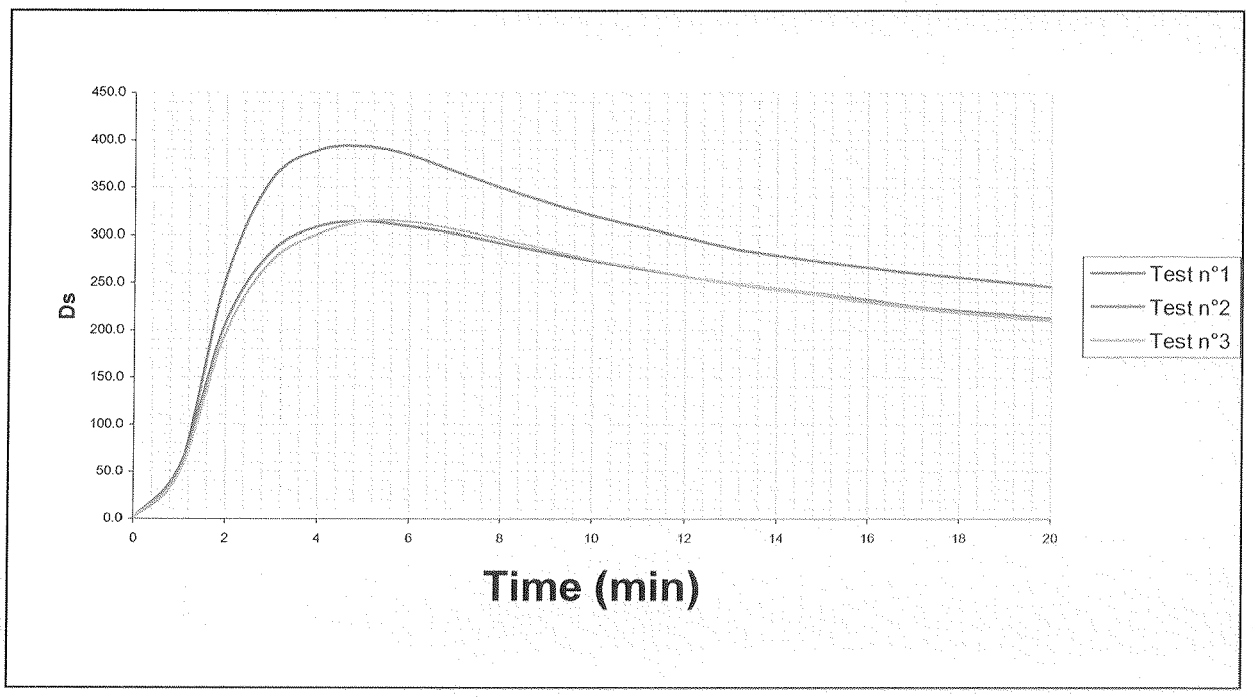
The material chars and ignites immediately, then smokes at about 15 s.
At about 1 min 30 s, flames reach a height of about 20 cm.
During the test, the material melts.
At the end of the test, the surface of the material is molten and partially destroyed.

Continued on next page

APPENDIX 3

CURVES OF TESTS WITH PILOT FLAMES

AIRDUC PUR 352 SE
Thickness : 0,85 mm



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DEFINITIONS OF PARAMETERS GIVEN IN PAGE 7

Dmax : maximum specific optical density reached during the test.

T (Dmax) : time in minutes to reach Dmax.

$$VOF4 = D1 + D2 + D3 + \frac{D4}{2}$$

Dc : specific optical density at the end of the test after smoke has been exhausted .

Mass (g) : mass of the sample tested, in grams.

Thickness (mm) : average thickness of the sample in millimeters.

Continued on next page

RESULTS OF THE TESTS WITH PILOT FLAMES

AIRDUC PUR 352 SE
Thickness : 0,85 mm

	Specifique Optical Density		
Time in minutes	Test n°1	Test n°2	Test n°3
0	0.0	0.0	0.0
1	50.8	54.6	48.8
2	253.3	208.0	196.8
3	358.5	283.0	273.0
4	389.3	308.4	301.2
5	393.6	314.3	314.7
6	384.3	308.8	313.8
7	366.9	301.4	306.1
8	350.1	291.3	296.5
9	334.8	282.0	285.5
10	320.6	272.7	274.2
11	308.4	264.5	265.7
12	297.9	256.4	256.9
13	286.7	249.3	249.1
14	279.0	243.3	242.8
15	272.1	238.1	237.1
16	266.2	232.1	229.4
17	260.4	224.8	223.4
18	255.6	220.5	218.5
19	251.0	216.3	214.1
20	245.6	212.2	210.4

Dmax	393.6	314.3	314.9
T(Dmax) (min)	4 min 57 s	4 min 59 s	5 min 31
VOF4	857.3	699.8	669.2
Dc	12.7	8.2	8.7
Mass (g)	16.7727	16.5726	16.3738
Thickness (mm)	0.9	0.9	0.9

LABORATOIRE DE TRAPPES
29 avenue Roger Hennequin – 78197 Trappes Cedex
Tél. : 01 30 69 10 00 – Fax : 01 30 69 12 34

CLASSIFICATION REPORT FOR FIRE BEHAVIOUR OF A MATERIAL

(free translation of French test report Dossier M040450 - Document DE/1)
Established according to the Department State Order dated on 21 november 2002

VALIDITY 5 YEARS FROM 28 MARCH 2011

N° M040450 - DE/2

and 4 pages appendices

Material submitted by	:	NORRES SCHLAUCHTECHNIK GmbH & Co.KG Am Stadthafen 12-18 45881 GELSENKIRCHEN - ALLEMAGNE
Commercial trademark	:	AIRDUC PUR 352 SE
Brief description	:	
Composition	:	Hose composed of a spring metal coated with a flame retardant polyurethane film
Mass	:	(2750 ± 15 %) g/m²
Thickness	:	(0,85 ± 10 %) mm
Colours	:	Transparent
Test report	:	**N° M040450- DE/2 dated on 14 June 2011**
Type of tests	:	Electric burner test, droplet test.
Classification	:	**M3**
Durability of classification (NF P 92-512 : 1986)		**NON LIMITED IN THEORY**

Considering the criteria resulting from the tests described in the appendiced Test Report **N° M031267 - DE/2.**

The indicated classification prejudges in no way the conformity of the materials commercialized to the samples submitted to the tests and can in no way be considered as a certificate of qualification.
This is not a product certification according to the L115-27 article of the consumption code and to the law dated on 3rd june 1994.

Note : Only full reproduction and by photocopy of the present classification report or the whole classification report and the appendiced lost report are authorized. **It contains 5 pages.**

Trappes, 14 June 2011

The Head of Fire Behaviour and Fire Safety Department

Valérie RUMBAU

The Responsible for Test

Antonia FAUSSAT

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N° 1-0606
Portée disponible
sur www.cofrac.fr

Appendix page 1

TEST REPORT

(free translation of French test report)
Established according to the Department State Order dated on 21 november 2002

VALIDITY 5 YEARS FROM 10 June 2011

N° M040450 - DE/2

1. PURPOSE OF TEST

The applicant supplied to the LNE in order to evaluate its fire behaviour and to determine its M classification.

2. ORIGIN AND CHARACTERISTICS OF SUBMITTED SAMPLES

. Test sponsor	:	NORRES SCHLAUCHTECHNIK GmbH & Co.KG
. Date of order	:	Letter dated on 2011/04/20
. Producer	:	NORRES SCHLAUCHTECHNIK GmbH & o.KG
. Distributor	:	
. Commercial trademark and reference	:	AIRDUC PUR 352 SE
. Characteristics attested by sponsor	:	
Global composition	:	Hose composed of a spring metal coated with a flame retardant polyurethane film
Mass	:	(2750 ± 15 %) g/m²
Thickness	:	(0,85 ± 10 %) mm
Colours	:	Transparent

3. TEST PROCEDURES AND RESULTS

The test report is following next page

Appendix page 2

TEST PROCEDURES FOR CLASSIFICATION OF FLEXIBLE MATERIALS WITH THICKNESS LOWER THAN 5 mm AND FLEXIBLE FILTERS WITH ALL THICKNESSES

1. ELECTRIC BURNER TEST (NF P 92-503 : 1995)

This test consists in submitting the samples to the triple action of :

- a heat radiance
- hot gases sweeping the surface of sample and promoting the eventual effects of flame spread,
- a pilot flame applied at different times in order to ignit the material.

The decisive elements are the duration of lighting and the destroyed length measured from the bottom edge of the sample.

2. COMPLEMENTARY TESTS

DROPLET TEST (NF P 92-505 : 1995)

The standardized sample, disposed on a defined metallic grid, is submitted to the radiance of an epiradiator located 3 cm below. During 5 minutes, the radiator is moved aside at each lighting and reput in place after extinguishing. During 5 more minutes, the radiator is kept in place. The decisive elements are the presence of flaming or non-flaming falling drips and the lighting of a cellulosic wool placed under the sample.

3. SAMPLES CONDITIONING

The samples submitted with normal dimensions are kept in a conditioned enclosure (23 ± 2 °C and 50 ± 5 % RH) until constant mass. The mass is considered as constant when 2 successive weighings with a 24 h interval are not different for more than 0.1% or 0.1 g.

4. CLASSIFICATION OF MATERIALS (NF P 92 - 507 : 2004)

It is established further to the electric burner test (and eventually by complementary tests).
Materials are classified in categories M1, M2, M3, M4.
Only the materials classified M1 with the electric burner test (no lighting for mote than 5 seconds after the withdrawwal of the pilot flame) can claim to the M0 classification .

5. DURABILITY

NONE

The test report is following next page

4. TESTS RESULTS

4.1. Electric burner test

	Sample 1				Sample 2				Sample 3				Sample 4				
Orientation	Right side				Wrong side				Right side				Wrong side				
Colour	Transparent				Transparent				Transparent				Transparent				
Piercing (hole)	Yes				Yes				Yes				Yes				
Lighting time (secondes)	20	-	-	-	20	-	-	-	20	-	-	-	20	-	-	-	
Duration of lighting after the withdrawal of the pilot flame (seconds)	38,4	-	-	-	53,8	-	-	-	48,8	-	-	-	36,3	-	-	-	
Duration of lighting **higher** than **5** s.	Yes																
Flaming falling drips or fragments	Yes				Yes				Yes				Yes				
Non-flaming falling drips	Yes				Yes				Yes				Yes				
Smoke quantity	Medium				Medium				Medium				Medium				Smoke colour : Grey
Destroyed or burned length (cm)	20,0				22,0				23,0				23,0				Average length L = 22,0
Average length **within 0** and **35** cm	Yes																
Average length **within 35** and **60** cm	No																

4.2. Complementary tests

Droplet test

	Sample 1	Sample 2	Sample 3	Sample 4
Colour	Transparent	Transparent	Transparent	Transparent
Flaming falling drips	No	No	No	No
Lighting of the wool	No	No	No	No

The test report is following next page

Appendix page 5

5. OBSERVATIONS ABOUT TESTS

Date for receipt of samples : 2011-05-06

Date of tests :2011-05-26

Electrique burner test

The specimens ignites and pierces at 20, 20, 20 and 20 seconds, they continue to burn, emitting a few gray smokes, more than 5 seconds after pilot flame removal.

Droplet test

Ther are flaming failling drops whith lighting of the cotton wool

6. CONCLUSION AND CLASSIFICATION

In view of the results, the material with the characteristics described in the first page of this test report

has the classification **M3.**

7. CLASSIFICATION DURABILITY

NON LIMITED IN THEORY

Trappes, 14 June 2011

The Head of Fire Behaviour
and Fire Safety Department

Valérie RUMBAU

Laboratoire national de métrologie et d'essais LNE

The Responsible for Test

Antonia FAUSSAT

Attention is attracted to the fact that the results obtained with the samples described in the present document are not generalizable without justification of the representativity of samples and tests.