



Testing. Advising. Assuring.

Exova Warringtonfire, Frankfurt is certificated by the Eisenbahn-Bundesamt (EBA), Ident. no. 031/09/07 as sachkundige Prüfstelle für Vorbeugenden Brandschutz in Schienenfahrzeugen nach DIN 5510

Test report No. 2013-1825

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Applicant: ELMO Sweden AB
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Date of order: 29.05.2013
Date of delivery: 29.05.2013
Date of tests: 05.06 + 07.06.2013
Assessment: Passed

Order

Testing the burning behaviour of a material according to DIN 54 837: 2007-12 and testing of the smoke development and toxicity of a material according to DIN EN ISO 5659-2: 2007 and according to DIN 5510: 2009-05, annex C, D for railway vehicles for public passenger traffic.

Description / designation of the test object

Leder: Elmotransport

Description of the relevant test procedure

DIN 54 837: 2007-12

DIN 5510-2:2009-05

DIN EN ISO 5659-2: 2007

1. Description of the test material

1.1 Details of the customer:

Leder: Elmotransport

Costruction:

Full color range (white →Black)

Thickness: 1,1 – 1,4 mm

Intended and use of product: Seat Cover

1.2 At the specimen preparation by Exova Warringtonfire, Frankfurt determined values:

Leather

Colour:	white	red	black
Whole Thickness:	1,8 -2,0 mm	1,8 -2,0 mm	1,8 -2,0 mm

The specimen selection was carried out by the customer. On the part of Exova Warringtonfire, Frankfurt there is no review and agreement of the requirements in the chapter one described material.

Testing after climatic storage at 23°C and 50 % humidity for at least 48 hours.

2. Test Results

2.1 Testing according to DIN 5510-2:2009-05, chapter 4.2.3, 4.3 and 4.4:

Preliminary: Colour: white, red, black

Longitudinal direction

Specimen no.		1	2	3	4	5	average
Ignition of the specimen after *	[s]	5	5	5			5
Afterflame time	[s]	0	0	0			0,0
Glowing	After [s]	-	-	-			-
	Glow Time [s]	-	-	-			-
Flame height	Maximum [cm]	15	15	15			15
	Reached after [s]	20	20	20			20
Falling	Non flaming	x	x	x			x
Sample parts	Flaming time [s]	-	-	-			-
Smoke Density	Maximum [%]	8	15	11			11,33
	Reached after [s]	50	70	60			60
	integral %*min	9	17	5			10,33
Destroyed part	length [cm]	17	16	13			15,33
Specimen destinguished after*	time [s]	-	-	-			-

* if not applicable, -

Remarks: Specimen 1: white→grained side of the burner
 Specimen 2: red→grained side of the burner
 Specimen 3: black→grained side of the burner

Flames burning through the samples. (hole formation)

2.2 Testing according to DIN 5510-2:2009-05, chapter 4.2.3, 4.3 and 4.4:

Preliminary: Colour: white, red, black

Cross direction

Specimen no.		1	2	3	4	5	average
Ignition of the specimen after *	[s]	7	7	7			7
Afterflame time	[s]	0	0	0			0,0
Glowing	After [s]	-	-	-			-
	Glow Time [s]	-	-	-			-
Flame height	Maximum [cm]	10	20	15			15
	Reached after [s]	20	45	20			28,33
Falling	Non flaming	x	x	x			x
Sample parts	Flaming time [s]	-	-	-			-
Smoke Density	Maximum [%]	9	18	9			12
	Reached after [s]	110	40	60			70
	integral %*min	5	28	5			12,67
Destroyed part	length [cm]	13	20	13			15,33
Specimen destinguished after*	time [s]	-	-	-			-

* if not applicable, -

Remarks: Specimen 1: white→grained side of the burner
 Specimen 2: red→grained side of the burner
 Specimen 3: black→grained side of the burner

Flames burning through the samples. (hole formation)

2.3 Testing according to DIN 5510-2:2009-05, chapter 4.2.3, 4.3 and 4.4:

Colour: red

Longitudinal direction

Specimen no.		1	2	3	4	5	average	
Ignition of the specimen after *	[s]	5	5	6	5	6	5,4	
Afterflame time	[s]	0	0	0	0	0	0,0	
Glowing	After	-	-	-	-	-	-	
	Glow time	[s]	-	-	-	-	-	
Flame height	Maximum	[cm]	15	15	20	15	15	16
	Reached after	[s]	20	20	105	20	20	37
Falling	Non flaming		x	x	x	x	x	x
Sample parts*	Flaming time	[s]	-	-	-	-	-	-
Smoke density	Maximum	[%]	15	10	16	11	21	14,6
	Reached after	[s]	70	100	80	60	90	80
	Integral	%*min	12	11	12	10	14	11,8
Destroyed part	length	[cm]	16	19	21	19	18	18,6
Specimen destinguished after*	time	[s]		-	-	-	-	-

* if not applicable, -

Remarks: Flames burning through the samples. (hole formation)

2.43 Testing according to DIN 5510-2:2009-05, chapter 4.2.3, 4.3 and 4.4:

Colour: red

Cross direction

Specimen no.		1	2	3	4	5	average	
Ignition of the specimen after *	[s]	7	5	6	6	5	5,8	
Afterflame time	[s]	0	0	0	0	0	0,0	
Glowing	After	-	-	-	-	-	-	
	Glow time	[s]	-	-	-	-	-	
Flame height	Maximum	[cm]	20	20	20	20	20	20
	Reached after	[s]	45	50	100	75	80	70
Falling	Non flaming		x	x	x	x	x	x
Sample parts*	Flaming time	[s]	-	-	-	-	-	-
Smoke density	Maximum	[%]	18	30	25	26	41	28
	Reached after	[s]	40	70	100	100	100	82
	Integral	%*min	14	21	16	16	27	18,8
Destroyed part	length	[cm]	20	18	19	19	21	19,4
Specimen destinguished after*	time	[s]		-	-	-	-	-

* if not applicable, -

Remarks: Flames burning through the samples. (hole formation)

Testing according to DIN 5510-2 chapter 4.2.3, 4.3 and 4.4

Appearance of the specimen after the test



**2.2.1 Measurements of the toxicity in accordance to DIN 5510-2: (2009-05) annex C:
(test results NBS-Box in accordance to ISO 5659)**

Colour: red

Analytic procedure:	Measurement of the toxicity with FTIR at 25 kW/m ² , flaming					
	Temperature sample extraction point: <40 °C					
Clima (23°C/50%r.F.):	>48	h	Testroom temperature / humidity	23	°C	50 % rel. LF

Specimen no.	weight [g]	ignition [s]	extinguishing [s]
1	7,6	80	312
2			
3			

Specimen	gas	conc. after 4 min ppm	conc. after 8 min ppm
1	Carbon	6332	9146
2	Dioxide		
3	CO ₂		
	average	6332	9146
1	Carbon	111	217
2	Monoxide		
3	CO		
	average	111	217
1	Hydrogen	0	0
2	Fluoride		
3	HF		
	average	0	0
1	Hydrogen	2	4
2	Chloride		
3	HCl		
	average	2	4
1	Hydrogen	20	31
2	Cyanide		
3	HCN		
	average	20	31
1	Nitrous Gases	84	85
2	NO-NO ₂		
3			
	average	84	85
1	Sulfur Dioxide	296	324
2	Hydrogen Sulfide		
3	SO ₂ -H ₂ S		
	average	296	324
1	Hydrogen	7	23
2	Bromide		
3	HBR		
	average	7	23

**2.2.2 Measurements of the toxicity in accordance to DIN 5510-2: (2009-05) annex C:
(test results NBS-Box in accordance to ISO 5659)**
Colour: black

Analytic procedure:	Measurement of the toxicity with FTIR at 25 kW/m ² , flaming					
	Temperature sample extraction point: <40 °C					
Clima (23°C/50%r.F.):	>48	h	Testroom temperature / humidity	23	°C	50 % rel. LF

Specimen no.	weight [g]	ignition [s]	extinguishing [s]
1	7,8	96	358
2			
3			

Specimen	gas	conc. after 4 min ppm	conc. after 8 min ppm
1	Carbon	6392	9300
2	Dioxide		
3	CO ₂		
	average	6392	9300
1	Carbon	49	121
2	Monoxide		
3	CO		
	average	49	121
1	Hydrogen	0	0
2	Fluoride		
3	HF		
	average	0	0
1	Hydrogen	2	5
2	Chloride		
3	HCl		
	average	2	5
1	Hydrogen	10	16
2	Cyanide		
3	HCN		
	average	10	16
1	Nitrous Gases	81	104
2	NO-NO ₂		
3			
	average	81	104
1	Sulfur Dioxide	327	331
2	Hydrogen Sulfide		
3	SO ₂ -H ₂ S		
	average	327	331
1	Hydrogen	1	0
2	Bromide		
3	HBR		
	average	1	0

2.2.3 Measurements of the toxicity in accordance to DIN 5510-2: (2009-05) annex C: (test results NBS-Box in accordance to ISO 5659)

Colour: white

Analytic procedure:	Measurement of the toxicity with FTIR at 25 kW/m ² , flaming						
	Temperature sample extraction point: <40 °C						
Clima (23°C/50%r.F.):	>48	h	Testroom temperature / humidity	23	°C	50	% rel. LF

Specimen no.	weight [g]	ignition [s]	extinguishing [s]
1	7,2	133	391
2	7,1	135	348
3	7,3	116	351

Specimen	gas	conc. after 4 min ppm	conc. after 8 min ppm
1	Carbon	6953	9611
2	Dioxide	6720	9492
3	CO ₂	6825	9492
	average	6833	9532

1	Carbon	55	155
2	Monoxide	58	152
3	CO	60	135
	average	58	147

1	Hydrogen	0	0
2	Fluoride	0	0
3	HF	1	1
	average	0	0

1	Hydrogen	1	7
2	Chloride	2	3
3	HCl	0	5
	average	1	5

1	Hydrogen	6	15
2	Cyanide	6	17
3	HCN	9	13
	average	7	15

1	Nitrous Gases	91	108
2	NO-NO ₂	83	105
3		93	106
	average	89	106

1	Sulfur Dioxide	386	400
2	Hydrogen Sulfide	345	383
3	SO ₂ -H ₂ S	401	412
	average	377	398

1	Hydrogen	2	18
2	Bromide	3	17
3	HBR	1	16
	average	2	17

2.3. Test Results:

Measurements for the smoke toxicity in the test chamber (NBS-Box) according DIN EN ISO 5659-2

Climatic storage (23°C/50%r.F.): > 48 h
Test modus: 25 KW/m² with pilot flame
Test duration: 600 s

Single results of the 3 tests: **Colour:** red

		Sample 1	Sample 2	Sample 3	average
Conventional Index of Toxicity (CIT)	CIT, 4 min	0,6402			0,6402
Conventional Index of Toxicity (CIT)	CIT, 8 min	0,7786			0,7786
Fraktionel effective dose (FED)	FED t _{zul} = 30min	0,708			0,708
Fraktionel effective dose (FED)	FED t _{zul} = 15min	0,319			0,319

Single results of the 3 tests: **Colour:** black

		Sample 1	Sample 2	Sample 3	average
Conventional Index of Toxicity (CIT)	CIT, 4 min	0,6165			0,6165
Conventional Index of Toxicity (CIT)	CIT, 8 min	0,8280			0,8280
Fraktionel effective dose (FED)	FED t _{zul} = 30min	0,745			0,745
Fraktionel effective dose (FED)	FED t _{zul} = 15min	0,331			0,331

Remarks: None

Single results of the 3 tests: **Colour: white**

		Sample 1	Sample 2	Sample 3	average
Conventional Index of Toxicity (CIT)	CIT, 4 min	0,6984	0,6379	0,7181	0,6848
Conventional Index of Toxicity (CIT)	CIT, 8 min	0,8558	0,8179	0,8419	0,8385
Fraktionel effective dose (FED)	FED t_{zul} = 30min	0,778	0,739	0,769	0,762
Fraktionel effective dose (FED)	FED t_{zul} = 15min	0,350	0,330	0,348	0,343

Remarks: None

3. Assessment

The in section 1 described material fulfils the requirements according to DIN 5510-2 chapter 4.2.3, 4.3 and 4.4:

of the flammability class **S 4**

of the smoke development class **SR 2**

of the dripping class **ST 2**

The in section 1 described material meets the requirements in relation to its toxicity:
(Set value according to DIN 5510-2:2009-05 $FED \leq 1$)

Colour: red

Actual value: $FED(t_{zul}= 30 \text{ min}) = 0,708$ $FED(t_{zul}= 15 \text{ min}) = 0,319$

Colour: black

Actual value: $FED(t_{zul}= 30 \text{ min}) = 0,745$ $FED(t_{zul}= 15 \text{ min}) = 0,331$

Colour: white

Actual value: $FED(t_{zul}= 30 \text{ min}) = 0,762$ $FED(t_{zul}= 15 \text{ min}) = 0,343$

4. Special comment

The fire test result is valid for the in section 1 described material in the tested thickness.

According to the experiences of the test laboratory the test results also includes colors in between the tested ones.

If combined with other materials (for example coatings, deposits) the burning behaviour could be influenced unfavourable so that the classification above is not valid any longer.

The burning behaviour in combination with other materials has to be tested separately.

Frankfurt, the 30.07.2013



M. Ronzheimer
Tester in Charge



Dipl.-Ing. T. Zachäus
Laboratory Supervisor

The validity of this test report, according to DIN 5510-2 (2009-05) ends at 15.07.2016, unless not otherwise noted from the approval authorities. These test results relate only to the behavior of the test specimens 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.

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