

Testing. Advising. Assuring.

# Test report no. 2011-1148

issued 24.02.2011

**Applicant:** Bluestar Silicones  
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69192 SAINT – FONTS Cedex  
France

**Date of order:** 31.01.2011  
**Date of sampling:** No official taking out of the samples from  
a representative of the Exova Brandhaus  
**Date of delivery:** 31.01.2011  
**Date of tests:** 03. + 04.02.2011

## Order

1. Testing the flame spread of building products in vertical configuration according to ISO 5658-2
2. Testing the heat release-, smoke production- and mass loss rate of a material according to DIN ISO 5660 (Cone-Calorimeter).
3. Testing the smoke density and toxicity of a material in the test chamber according to EN ISO 5659-2 (NBS-Box)
4. Classification according to new railway standard CEN/TS 45545-2 - 2009

## Description / designation of the test object

Silicone Heat Cure Rubber FR 8750 E

## Description of the relevant test procedure

ISO 5658-2 - 2006

ISO 5660-1 - 2002

EN ISO 5659-2 - 2007

CEN/TS 45545-2 - 2009

## 1. Description of the test material

### 1.1 Details of the customer:

Silicone Heat Cure Rubber

Name of the product: FR 8750 E  
Trial number reference: PAO 2790  
Sample thickness: 2 mm  
Colour: white cream  
Intended end use: fire resistance application

### 1.2 By the specimen preparation in Exova Brandhaus determined values:

Rubber panels Gummipplatten

Colour: white - cream  
Thickness: 2 mm (average)  
Square weight: 2,7 Kg/m<sup>2</sup> (average)

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

## 2. Test results

### 2.1.1 Test paper according to ISO 5658-2 – 2006:

Specimen no.		1	2	3	4	5
<b>Test results:</b>						
Ignition after	[s]	10	10	10		
Reaching the 50 mm station after	[s]	20	20	20		
the 100 mm station after	[s]	55	45	55		
the 150 mm station after	[s]	65	55	60		
the 200 mm station after	[s]	70	75	65		
the 250 mm station after	[s]	90	100	75		
the 300 mm station after	[s]	120	130	110		
the 350 mm station after	[s]	165	170	160		
the 400 mm station after	[s]	-	275	-		
the 450 mm station after	[s]	-	-	-		
the 500 mm station after	[s]	-	-	-		
the 550 mm station after	[s]	-	-	-		
the 600 mm station after	[s]	-	-	-		
the 650 mm station after	[s]	-	-	-		
the 700 mm station after	[s]	-	-	-		
the 750 mm station after	[s]	-	-	-		
Flames extinguish after	[s]	560	510	420		
Final spread of flame up to	[mm]	350	400	360		
Total duration of the test	[s]	1200	1200	1200		
Specimen drips off / pieces fall off	No burning after	[s]	-	-	-	
	Burning after	[s]	-	-	-	
Smoke generation after	[s]	10	10	10		
Charring / discolouring / melting after	[s]	10	10	10		
Charring / discolouring / melting up to	[mm]	430	450	410		
<b>Further remarks:</b>		Curve out of the material.				

**2.1.2 Determined burning characteristic:**

specimen no..	$Q_{sb}$ MJ/m <sup>2</sup>	CFE kW/m <sup>2</sup>
1	3,43	23,9
2	3,78	18,2
3	3,14	22,6
4		
5		
<b>average</b>	<b>3,45</b>	<b>21,6</b>

n.d. = not determinable because 150 mm mark not reached.

$Q_{sb}$  = Heat for sustained burning

CFE = Critical flux at extinguishment

Appearance of the specimen after the tests:



## 2.2.1 Test results

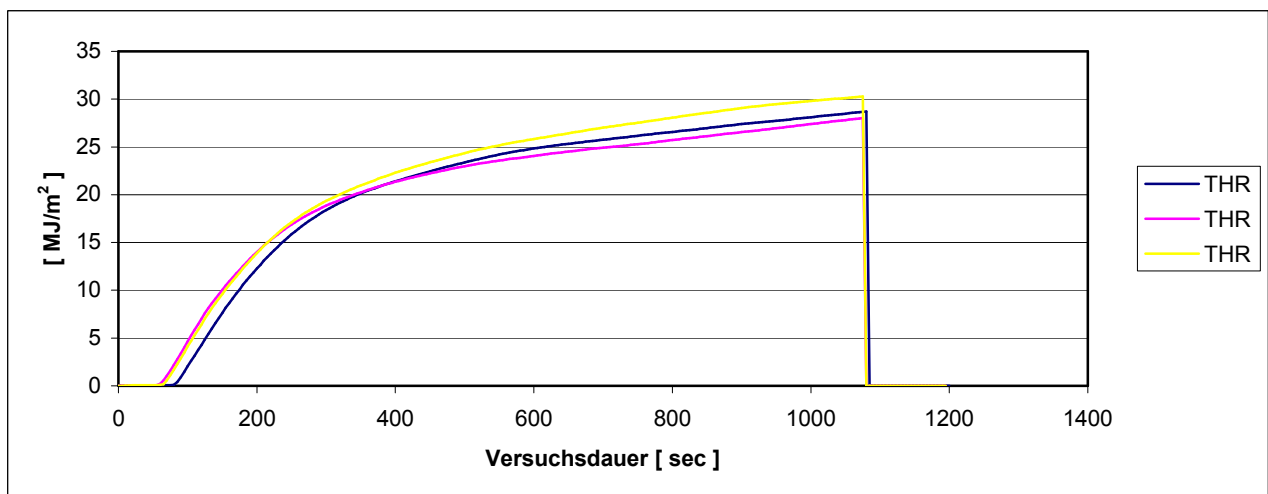
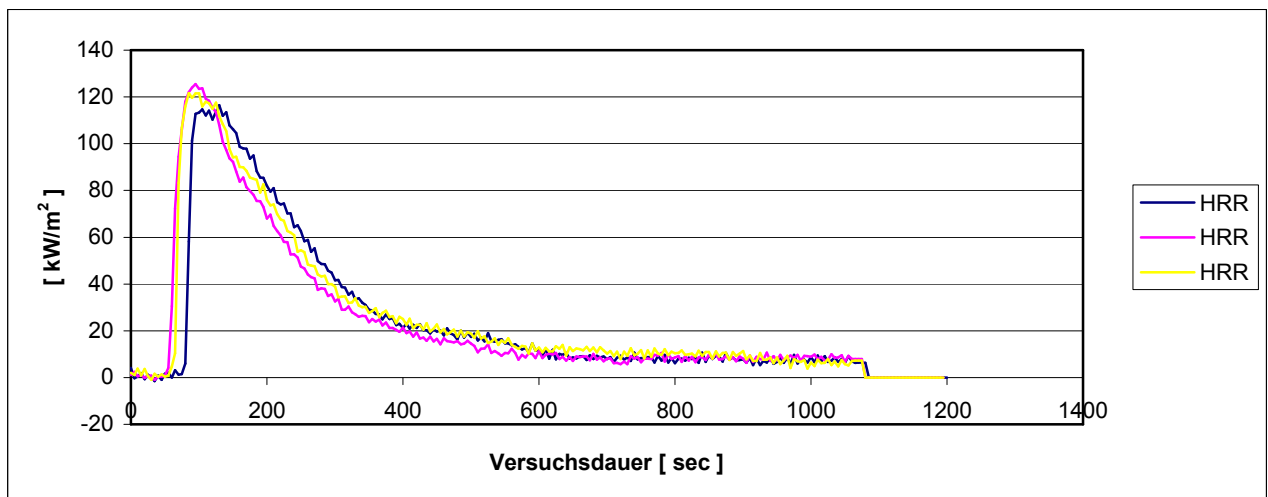
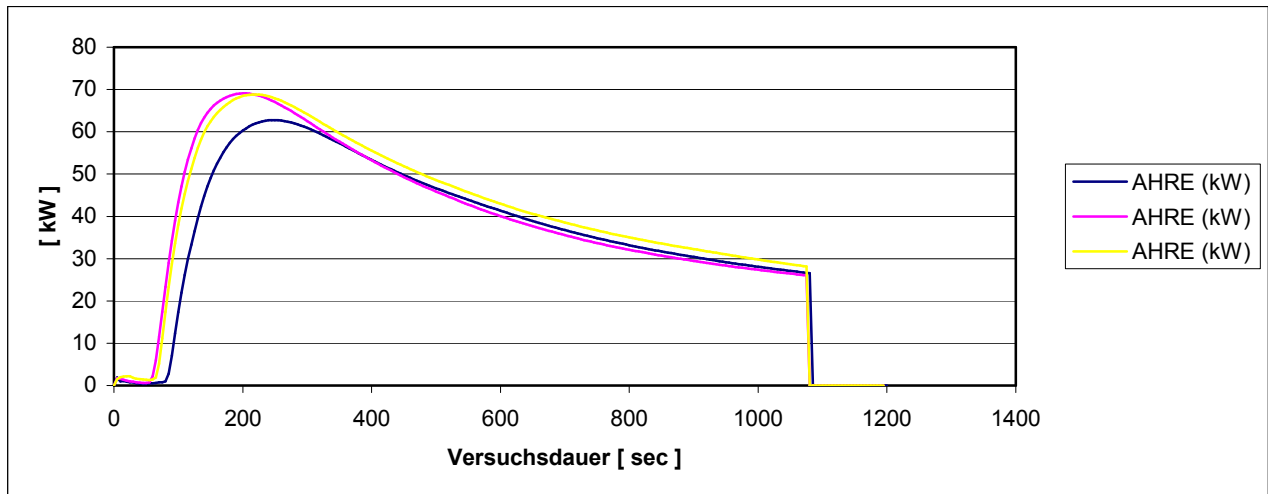
## Test results Cone-Calorimeter according to ISO 5660

Clima storage (23°C/50%r.F.):	>24h
Nominal heat flux [KW/m <sup>2</sup> ]:	50
Heat flux calibration constant C:	0,04
Testroom temperature / -humidity:	21°C / 40% rel. LF

Single test results of 3 tests:

		Specimen 1	Specimen 2	Specimen 3	Average
Time to ignition	[s]	86	76	66	76
Mass of specimen	[g]	28	26,30	29,10	27,80
Mass loss rate	[g/m <sup>2</sup> s]	2,09	1,49	1,02	1,53
Mass loss	[g]	4,83	4,18	4,99	4,67
Marhe after start	[KW/m <sup>2</sup> ]	62,77	69,08	68,83	66,90
Heat release rate (180 s)	[KW/m <sup>2</sup> ]	79,69	83,88	81,91	81,83
Heat release rate (300 s)	[KW/m <sup>2</sup> ]	66,79	66,32	67,93	67,01
Heat release rate (top)	[KW/m <sup>2</sup> ]	116,39	125,48	121,69	121,19
Effective heat of combustion	[MJ/Kg]	52,10	56,83	53,22	54,05
Total heat release THR	THR	28,69	28,02	30,29	29,00
Specific extinction area	[m <sup>2</sup> /Kg]	691,39	789,34	687,28	722,67
Carbon monoxid	[g/g]	0,05	0,15	0,01	0,07
Carbon dioxid	[g/g]	2,83	2,96	2,83	2,87
Total smoke production	TSP	410,15	403,24	412,59	408,66
End of test	[s]	1200	1195	1195	1196,67

2.2.2 Diagrams:



**2.3.1 Test results NBS-Box according to ISO 5659**

Clima storage (23°C/50%r.F.): >24h  
 Testmodus: 50 KW/m<sup>2</sup>  
**Test duration:** 1200 s  
**Testroom temperature/humidity:** 21°C / 40% rel. LF

Single test results of 3 tests:

		<b>Specimen 1</b>	<b>Specimen 2</b>	<b>Specimen 3</b>	<b>Average</b>
<b>Initial mass</b>	<b>[g]</b>	15,1	15,3	15,9	<b>15,43</b>
<b>Final mass</b>	<b>[g]</b>	12,6	12,3	12,6	<b>12,5</b>
<b>Mass loss</b>	<b>[g]</b>	2,5	3,0	3,3	<b>2,93</b>
<b>Mass loss</b>	<b>[%]</b>	16,6	19,6	20,8	<b>19</b>
<b>Max. spec. opt. density up to 4 minutes</b>	<b>DS</b>	57,88	64,11	67,7	<b>63,23</b>
<b>Max. spec. opt. density</b>	<b>DS</b>	114,5	138,09	147,68	<b>133,42</b>
<b>Time to max. opt. density</b>	<b>[s]</b>	1012	1101	1177	<b>1096,67</b>
<b>Valeur obscurcissement fumée</b>	<b>VOF4 [min]</b>	100	109,83	113,52	<b>107,78</b>
<b>Conventional Index of Toxicity</b>	<b>(CIT) 4 min</b>	0,0254	0,0249	0,0224	<b>0,0242</b>
<b>Conventional Index of Toxicity</b>	<b>(CIT) 8 min</b>	0,1003	0,0709	0,0967	<b>0,0893</b>
<b>Time to ignition</b>	<b>[s]</b>	-	-	-	
<b>Time to extinguishing</b>	<b>[s]</b>	-	-	-	

Remarks: none.

**2.3.2 Measurement of the smoke density:**

specimen	weight [ g ]	ignition [ s ]	extinguish [ s ]
1	15,1	-	-
2	15,3	-	-
3	15,9	-	-

minutes	DS specimen	DS specimen	DS specimen
	1	2	3
1	2	3	2
2	26	24	25
3	44	51	53
4	58	64	68
5	66	74	77
6	73	82	87
7	81	90	96
8	89	97	104
9	96	104	110
10	102	111	117
11	106	117	123
12	109	123	128
13	111	126	132
14	113	128	140
15	114	130	143
16	114	133	145
17	114	133	146
18	113	137	147
19	113	138	147
20	112	137	147
<b>DS max 4 minutes</b>	58	64	68
<b>VOF4</b>	101	110	114



**2.3.3 Measurement of the toxicity:**

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

Specimen no.	gas	conc. after 4 min ppm	conc. after 8 min ppm
1	Carbon	1010	1245
2	Dioxid	935	1100
3	CO <sub>2</sub>	1048	1268
	<b>average</b>	998	1204
1	Carbon	135	1107
2	Monoxide	131	777
3	CO	173	967
	<b>average</b>	146	950
1	Hydrogen	1	2
2	Fluoride	1	1
3	HF	1	2
	<b>average</b>	1	2
1	Hydrogen	0	0
2	Chloride	0	0
3	HCl	0	0
	<b>average</b>	0	0
1	Hydrogen	0	0
2	Cyanide	0	0
3	HCN	0	0
	<b>average</b>	0	0
1	Nitrous Gases	0	0
2	NO-NO <sub>2</sub>	0	0
3		0	0
	<b>average</b>	0	0
1	Suflor Dioxide	15	25
2	Hydrogen Sulfide	15	19
3	SO <sub>2</sub> -H <sub>2</sub> S	8	32
	<b>average</b>	13	25
1		0	0
2		0	0
3	HBR	0	0
	<b>average</b>	0	0

## Assessment

The in chapter 1 described material fulfills after the tests the requirements of the class HL 2 according to CEN TS 45545-2\_2009 for R1 - and R6 - material.

Table 7 – Set of material requirements, R1

Test method reference	Parameter Unit	Requirement Definition	HL 1	HL 2	HL 3
T02 ISO 5658-2	CFE KW/m <sup>2</sup>	Minimum	20	20	20
T03.01 ISO 5660-1: 50 KW/m <sup>2</sup>	Marhe KW/m <sup>2</sup>	Maximum	-	90	60
T10.01 EN ISO 5659-2: 50 kW/m <sup>2</sup>	D <sub>s</sub> (4) dimensionless	Maximum	600	300	150
T10.02 EN ISO 5659-2: 50 kW/m <sup>2</sup>	VOF4 min	Maximum	1200	600	300
T11.01 EN ISO 5659-2: 50 kW/m <sup>2</sup>	CIT <sub>G</sub> dimensionless	Maximum	1,2	0,9	0,75

Table 7 – Set of material requirements, R6

Test method reference	Parameter Unit	Requirement Definition	HL 1	HL 2	HL 3
T02 ISO 5658-2	CFE KW/m <sup>2</sup>	Minimum	20	20	20
T03.01 ISO 5660-1: 50 KW/m <sup>2</sup>	Marhe KW/m <sup>2</sup>	Maximum	-	90	60
T10.01 EN ISO 5659-2: 50 kW/m <sup>2</sup>	D <sub>s</sub> max dimensionless	Maximum	-	600	300
T11.01 EN ISO 5659-2: 50 kW/m <sup>2</sup>	CIT <sub>G</sub> dimensionless	Maximum	-	1,8	1,5

## Special comment

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

In the composition 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 composition with other materials has to be tested separately.

Frankfurt, the 24.02.2011



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Tester in charge



Dipl.-Ing. T. Zachäus  
Laboratory Supervisor

The results of the tests relate only to the behaviour of the test specimen which is designated on the top.

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