

Test Report No.: 9482 / 32003

Date: 25.07.2011

BASF SE  
Brandschutztechnik  
G-KTF/EA - A521  
D-67056 Ludwigshafen

Test according to

**DIN 5510 Part 2 : 2009-05**

**Preventive fire protection in railway vehicles - Part 2: Fire behaviour and fire side effects of materials and parts; Classification, requirements and test methods Determination of smoke toxicity in the smoke chamber according to ISO 5659-2**

Client:

Henkel AG & Co. KGaA Heidelberg  
Standort Heidelberg  
Henkel-Teroson-Strasse 57  
69123 Heidelberg

The results refer exclusively to the tested samples.

As an accredited Test Laboratory, the BASF SE Fire Safety Technology Test Centre is authorized to conduct fire tests in accordance with DIN EN ISO/IEC 17025 : 2005.

DAkKS-Register-No.: D-PL-14121-07-00



ID number EBA (German Rail): EBA – 012 / 07 / 10 –

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Receipt of order: 06.06.2011  
Receipt of samples: 06.06.2011  
Date of test: 14.07.2011

## 1. Material: (information supplied by client)

Terostat MS 935 grey

Colour:

Field of application: Glueing and sealing

## 2. Summary of results and classification:

Fractional effective dose		Requirement set No. Hazard Level	Allowable time of exposure	DIN 5510-2
FED <sub>15</sub>	0,09	*	30 min	FED ≤ 1 fulfilled
FED <sub>30</sub>	0,20			

### Remarks:


\*no requirements defined.

Note: This report is valid for 3 years according to DIN 5510-2 (2009:05), if not differently regulated by the responsible authority.

Any conclusions we draw about the fire safety of the materials we test are based exclusively on the results of the test under the conditions described.

The extent to which such conclusions can be applied to non-tested material under non-standard conditions is the sole responsibility of the customer and is done so at his own risk.

BASF Fire Safety Technology

  
Dr. Henn  
Head of Laboratory

Ludwigshafen, 25.07.2011

  
Lehr  
Technician

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### 3. Material:

#### Information supplied by client:

Terostat MS 935 grey  
Sample design: Product on Aluminum plate, anodized

#### Additional details from test laboratory

Thickness Aluminium plate = 1mm

### 4. Samples:

#### Sample size (determined by BASF test laboratory):

Length:	75,01 [mm]	Weight:	27,44 [g]
Width:	74,70 [mm]	Weight per unit area:	4,89 [kg/m <sup>2</sup> ]
Thickness:	2,61 [mm]	Density:	[kg/m <sup>3</sup> ]
Outer diameter:	[mm]	Remarks:	
Inner diameter:	[mm]		

#### Pre-conditioning:

	Conditions	Duration days
Client: (information supplied by client)		
Test laboratory:	Standard 23/50-1 DIN 50014	38

#### Sample preparation:

Exposed surface: Coating

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### 5. Test results:

#### 5.1 Test conditions

FTIR Spectrometer	Thermo Electron Avatar				
FTIR gas cell	AXIOM 2m LFT Gascell LFT 220				
Filter	M&C Products FT-F-2T-H2				
Irradiance	[kW/m <sup>2</sup> ]	25			
Test mode	flaming				
Sample	1	2	3	Avg.	
Initial weight without Al sheet	[g]	27,4	26,0	28,0	27,2
Initial weight with Al sheet	[g]	28,2	26,9	28,9	28,0
Final weight with Al sheet	[g]	20,6	20,4	22,3	21,1
Mass loss	[g]	7,6	6,5	6,6	6,9
Chamber wall temperature at start of test	[°C]	40	41	43	41
Temperature at sampling point (4')	[°C]	64	66	67	65,7
Temperature at sampling point (8')	[°C]	59	61	64	61,3
Chamber pressure at 4'	[mmH <sub>2</sub> O]	82	66	80	76
Chamber pressure at 8'	[mmH <sub>2</sub> O]	-2	-5	-1	-3
Ignition after	[s]	86	65	79	77
Extinguishment	[s]	445	407	452	435
Ambient temperature	[°C]	24			
Ambient pressure	[bar]	1,001			

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## 5.2 Gas concentrations and smoke gas toxicity

Sampling Time		Gas concentrations							
		4 minutes				8 minutes			
Sample #		1	2	3	Avg.	1	2	3	Avg.
CO <sub>2</sub>	[mg/m <sup>3</sup> ]	18.157	16.903	16.867	17.309	26.072	22.234	24.458	24.255
CO	[mg/m <sup>3</sup> ]	90	101	100	97	225	268	220	238
HF	[mg/m <sup>3</sup> ]	nd	nd	nd	nd	nd	nd	nd	nd
HCl	[mg/m <sup>3</sup> ]	nd	nd	nd	nd	nd	nd	nd	nd
HBr	[mg/m <sup>3</sup> ]	nd	nd	nd	nd	nd	nd	nd	nd
HCN	[mg/m <sup>3</sup> ]	nd	nd	nd	nd	nd	nd	nd	nd
NO	[mg/m <sup>3</sup> ]	nd	nd	nd	nd	nd	nd	nd	nd
NO <sub>2</sub>	[mg/m <sup>3</sup> ]	nd	nd	nd	nd	nd	nd	nd	nd
SO <sub>2</sub>	[mg/m <sup>3</sup> ]	503	488	510	500	620	526	622	589
<b>CIT</b>		<b>0,18</b>	<b>0,1746</b>	<b>0,181</b>	<b>0,1786</b>	<b>0,2328</b>	<b>0,2021</b>	<b>0,2314</b>	<b>0,2221</b>
<sup>1)</sup> Analysis carried out in cooperation with BASF-Analytix <sup>2)</sup> nd = not detected									

## 5.3 Calculation of allowable FED

<b>FED(t<sub>zul</sub>) =</b>	$\frac{(CIT_4 + 0,5 \cdot CIT_8) \cdot 4 \text{ min} + CIT_8 \cdot (t_{zul} - 8 \text{ min})}{30 \text{ min}}$
<b>FED (15 min) =</b>	$\frac{4 \cdot CIT_4 + 9 \cdot CIT_8}{30}$
<b>FED (15, determined)</b>	<b>0,0904</b>
<b>FED (30 min) =</b>	$\frac{4 \cdot CIT_4 + 24 \cdot CIT_8}{30}$
<b>FED (30, determined)</b>	<b>0,2015</b>

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## Observations:

## 6. Test equipment:

Test apparatus	PE 0018
Calliper gauge	MB 0038
Balance	MW 0007
FTIR spectrometer	MI 0001

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## 7. Requirements: FED ≤ 1 at exposure times of 15 or 30 minutes

1	2	3	4	5
No.	Vehicle parts requiring certification	Fire protection level as specified in DIN 5510-1	Maximum allowable exposure time min	Remarks
1	Vehicle superstructure, including bottom floor, external vehicle cladding (roof, sides, face) but excluding driver's cab	1	—	
2		2 to 4	30	
3	External doors, face end doors, skirts, cladding and superstructure of driver's cab, fittings	1	—	
4		2 to 4	30	
5	Roof-mounted parts and roof edge fairing parts	2 to 4	30	
6	Underframe streamlining	1	—	
7		2 to 4	30	
8	External windows, frames without seals	1 to 3	—	
9		4	30	
10	External windows, pane and pane composites	1	—	
11		2 to 4	30	
12	Gangway between coaches	1	—	
13		2 to 4	30	
14	Cladding of gangway systems (rubber cylinders, bellows-type)	1	—	
15		2 to 4	15	
16	Ducts for heating, ventilation and cooling – built into roof section	1	—	
17		2 to 4	30	
18	Ducts for heating, ventilation and cooling – built into areas other than the roof section	1	—	
19		2 to 4	30	
20	Hoses for heating, ventilation and cooling	1	—	
21		2 to 4	15	
22	Conduits for electrical installations and electrical installation tubes – built into roof section	1	—	Conduits and tubing for electrical installations in engine spaces, switchgear cabinets and control boxes are exempted.
23		2 to 4	30	
24	Conduits for electrical installations and electrical installation tubes – built into areas other than the roof section	1	—	Conduits and tubing for electrical installations in engine spaces, switchgear cabinets and control boxes are exempted.
25		2 to 4	30	
26	Pipes and hoses for fuel, hydraulics, pneumatics, water and drainage	1	—	
27		2 to 4	15	

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## Requirements (2)

1	2	3	4	5
No.	Vehicle parts requiring certification	Fire protection level as specified in DIN 5510-1	Requirement: permitted exposure time min	Remarks
28	Insulating materials (sound-proofing and/or thermal insulation) for roofs, side panels and face ends, external doors and floors, applied to the internal surfaces of the vehicle	1	—	see nos. 30 and 31
29		3	—	
30	Insulating materials (sound-proofing and/or thermal insulation) for roofs, side panels and face ends, external doors and floors, applied to the internal surfaces of the vehicle – areas below bottom edge of windows	2 and 4	30	
31				
32	Underbody coating	1 to 4	—	
33	Insulating materials for roofs, side panels and face ends, external doors and floors (products in sheet or web form)	1	—	
34	Insulating materials for side and face end panels and floors in the – areas below the bottom edge of the windows as well as insulating material for external doors (products in sheet or web form)	2 to 4	30	
35	Insulating materials for roofs, side panels and face ends (products in sheet or web form) – areas above the bottom edge of the windows	2 and 4	—	S5 required
36		3	30	
37	Internal furnishings such as ceilings, ceiling recesses as well as hatches, boxes and hoods in the ceiling and ceiling recess area	1	—	
38		2 and 3	30	
39		4	—	S5 required
40	Cover strips, cover profiles in the ceiling and ceiling recess area	1	—	
41		2 and 3	30	
42		4	—	S5 required
43	Interior furnishings such as claddings of side and face panels, partition walls, partitions and covers, boxes, cabinets and hoods in this area; interior doors and interior cladding of the external doors.	1	—	
44		2 and 3	30	
45		4	30	
46	Cover strips, profiles and frames; mountings and covers for information and advertising panels, newspaper boxes; lockers and advertising boxes in the vehicle's interior	1	—	
47		2 and 3	30	
48		4	30	



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## Requirements (3):

1	2	3	4	5
No.	Vehicle parts requiring certification	Fire protection level as specified in DIN 5510-1	Requirement: permitted exposure time min	Remarks
49	Floors including steps (substrate and floor covering permanently joined)	1	—	
50		2 to 4	30	
51	Runners, carpets	1	—	
52		2	15	
53		3 and 4	30	
54	Covers for luminaires, including grilles	1	—	
55		2 and 3	30	
56		4	—	S5 required
57	Luggage racks	1	—	
58		2	30	
59		3	30	
60		4	—	S5 required
61	Window locking frame, if not included in no. 43	1	—	
62	Window locking frame, if not included in no. 44	2 and 3	30	
63	Window locking frame, if not included in no. 45	4	30	
64	Window framing	1	—	
65		2 to 4	15	
66	Curtains and roller blinds	1	—	
67		2 and 3	30	
68		4	30	
69	Tables, windowsill tables, folding tables	1	—	
70		2 and 3	30	
71		4	30	
72	Dynamically stressed seals for external and interior doors; seals for doors in the vehicle face ends	2 to 4	15	
73	Statically stressed seals for external and interior doors	2 to 4	15	
74	Seat	1	—	
75		2 to 4	30	Can also be evaluated in tests under real conditions
76	Folding seats without back rest (auxiliary seats), arm rests, head rests, side supports on headrests, pillows	1	—	If the material structure is identical to that of a tested seat (nos. 74 and 75) certification corresponding to this component is valid.
77		2 to 4	30	

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## Requirements (4):

1	2	3	4	5
No.	Vehicle parts requiring certification	Fire protection level as specified in DIN 5510-1	Requirement permitted exposure time min	Remarks
78	Covers and cladding parts of seats, seat shells, backrest shells, folding tables attached to passenger seats	1	—	
79		2 and 3	30	
80		4	30	
81	Hand-holds and hand rails	1 to 4	—	no SR requirements
82	Ashtrays, waste bins and bins for collecting recyclable materials	1 to 4	—	S5 required
83	Water containers to be installed in the vehicle interior excluding enclosed driver's cabs and engine compartments	2 to 4	30	
84	Galley components in the vicinity of the stove	1 to 4	—	S5 required
85	Other galley components	1 to 4	—	no SR requirements
86	Couchettes and beds (mattresses and/or upholstery combinations) without bed linen	1 to 4	30	Can also be evaluated in tests under real conditions
87	Interior furnishings such as walls, ceilings, doors, lids, washbasins, luminaire covers and mirrors in toilets and washrooms	1 to 3	30	
88		4	—	S5 required
89	Washbasins, toilet basins, soap dispensers, paper towel containers, containers for cleaning cloths and hygiene bags, cigarette rests in toilets and washrooms	1 to 4	—	S5 required
90	Toilet covers, toilet seats	1 to 4	30	
91	Floors in toilets and washrooms	1 to 4	30	
92	Interior furnishings of closed staff rooms, e.g. walls, ceilings, doors, lids, boxes, cabinets and driver's desks	1 to 4	—	no SR requirements
93	Floors in closed staff rooms	1 to 4	—	no smoke generation requirements
94	Seats for enclosed staff compartments	1 to 4	—	no smoke generation requirements

## Requirements (5): Reference concentrations for toxic gases

Carbon dioxide	CO <sub>2</sub>	72.000	[mg/m <sup>3</sup> ]
Carbon monoxide	CO	1.380	[mg/m <sup>3</sup> ]
Hydrogen fluoride	HF	25	[mg/m <sup>3</sup> ]
Hydrogen chloride	HCl	75	[mg/m <sup>3</sup> ]
Hydrogen bromide	HBr	99	[mg/m <sup>3</sup> ]
Hydrogen cyanide	HCN	55	[mg/m <sup>3</sup> ]
Nitrogen dioxide	NO <sub>2</sub>	38	[mg/m <sup>3</sup> ]
Sulfur dioxide	SO <sub>2</sub>	262	[mg/m <sup>3</sup> ]