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Sample ID : Fiberglass Reinforced Composite Laminates
İLKESTER GFR-4 / 40 GELCOAT + İLKESTER FR-40 POLYESTER

Description : Gel-coat, İLKESTER GFR-4 / 40 (layer thickness 600 – 800 micron)
Resin, İLKESTER FR-40 (Fiber glass, 5 layer 300 g/m2 chopped strand mat)

Thickness : 5 mm

	TEST	METHOD	RESULT		
-	Preventive fire protection in railway vehicles-Part 2: Fire behavior and side effects of materials and parts- Classification, requirements and test methods	DIN 5510-2	PASS		
			S4	SR2	ST2

NOTE: This test result replaces the conformity assessment, can be presented to official institutions, and used in products and brochures.



Seal

Customer Representative
Merve Nur KIRVELİ

Laboratory Manager
Merve ÖZLÜ

Test results, methods and other information about the sample shown in the relevant pages of this Report are based on the information specified in accordance with "Test Request Form (PR03-F01) conveyed to us from the Applicant. Test results are valid for the sample as identified above. Sample may not represent the lot which it belongs. This Report does not replace a Product Certificate. Full report or any part of it may not be reproduced or used for any other purpose without the written permission of EUROLAB Laboratory. Sampling has not been done by us. Unsigned and unsealed Reports are invalid. Analysis as indicated with "*" are in the Scope of our Accreditation Certificate issued from UAF according to TS EN ISO/IEC 17020, 17025, Analysis as indicated with "***" are performed at the external laboratories using accredited test methods according to EN ISO/IEC 17020, 17025 from UAF. Possible extra notes may add with starting "N" to related pages. Tested and remaining samples will be kept in specified terms & conditions at test request and/or proposal form. Physically, chemically and microbiologically decomposed samples are discarded regardless of the storage period. Applicant can not claim any right in this regard. Results are shown in this Report do not include Measurement Uncertainty values. Measurement Uncertainty values are not taken in consideration during Pass/Fail assessment the of test results shown in this Report. Evaluation of the test results using Measurement Uncertainty values is the responsibility of the Applicant.

PR33-F01/08.10.2015/Rev:17.01.2017-R01

DIN 5510-2: Preventive fire protection in railway vehicles-Part 2: Fire behavior and side effects of materials and parts- Classification, requirements and test methods

Scope

This standard applies to rail vehicles (here in after referred to as vehicles) that fall under the scope of the Railway Building and Operating Regulations, the Railway Building and Operating Regulations for Narrow Gauge Railways, the Magnetic Levitation Building and Operating Regulations and the Ordinance over the construction and operation of the trams. Its purpose is

- a classification of the burning behavior and the side effects of the fire,
- the test procedures required for this,
- to specify the requirements for the fire behavior and the side effects of fire of the materials and components used in the construction of the vehicles for reasons of preventive fire protection.

This standard does not apply to requirements for facilities for the storage and transport of liquid and gaseous fuels. A corresponding standard is in preparation.

Requirements

Inflammability Class

Inflammability Class	S1	S2	S3	S4	S5
The length of the destroyed area ^a	≤ 15 cm	≤30 cm	≤25 cm	≤20 cm	0 cm ^b
Time after flamme	0 s	With quenching the sample is allowed to burn until the end of the test	≤100 s (only value ≤120 s)	≤10 s	0 s
^a In addition to DIN 54837, smelting is also considered a destroyed area. ^b Organic layers with a nominal <0.3 mm in composite materials will not be taken into account when assessing the length destroyed.					

Smoke Development Class

Smoke Development Class	Integral of light attenuation
SR1 not reached	>100 (%. min)
SR1	≤100 (%. min)
SR2	≤50 (%. min)

Class of the capacity of forming drops

Dripability class	Observations
ST1	drips / burns
ST2	no drip/drop or burn

Smoke Toxicity

- Test Environment

Temperature (°C)	Humidity (%)
15-35	20-80

- Conditioning

Temperature (°C)	Humidity (%)	Time (h)
23±2	50±5	24

The CIT (Conventional Index of Toxicity) value is used to determine the toxicity of the smoke gases. The CIT value is calculated from two factors:

$$\text{CIT} = [\text{scaling factor } f] * [\text{total portion}]$$

$$\text{CIT} = f \times \sum_{i=1}^{i=8} \frac{ci}{Ci}$$

$$f = 0,0805$$

The CIT value is dimensionless. The total share is formed from the ratios of the emission value to the reference value of the individual gas components. The following eight gases are to be analyzed:

- CO₂, CO, HF, HCl, HBr, HCN, NO₂, SO₂

Flue gas component		Reference Concentration (mg/m ³)
Carbon dioxide	CO ₂	72000
Carbon monoxide	CO	1380
Hydrogen fluoride	HF	25
Hydrogen chloride	HCl	75
Hydrogen bromide	HBr	99
Hydrogen cyanide	HCN	55
Nitrogen dioxide	NO ₂ ^a	38
Sulfur dioxide	SO ₂	262
^{a)} It includes NO ₂ , NO ₂ , and NO (reference value corresponds to the IDLH value of NO ₂).		

Execution And Evaluation Of The Test

Once systems are prepared for the extraction and measurement of fire gas components, the test is carried out as follows:

- the temperature of the test chamber wall is checked (for 25 kW / m² it should be (40±5) ° C);
- The sample is taken from standard environmental conditions, then alone and by weighing after wrapping in aluminum foil;
- the sample is placed in the sample holder;
- the protective screen is placed between the radiation cone and the specimen support;
- Temperature recording at the sampling point is started with a time interval of 5 seconds; dummy test sample is removed, sample is placed under the radiation cone;
- The test room is closed, the protective screen is removed and the stopwatch is started.

After 4 minutes and 8 minutes of the test, fumes are removed for analysis. Sampling inside the test chamber is carried out, depending on the method of analysis - using one or more stainless steel probes (5 mm inner diameter) projecting vertically from the middle of the ceiling into the smoke chamber.

Sample Information

Thickness (mm)	5
Length (mm)	500
Width (mm)	190
Colour	White

Results

- Result of overview

**	**	**	1	2	3	Average
Ignition of sample	Time	(s)	30	33	32	31.6
Afterburning of sample		(s)	0	0	0	0
Afterglow of sample		(s)	---	---	---	---
Height of flames	Maximum	(cm)	4,2	4	4,5	4
	Reached after	(s)	75	77	76	76
Falling- off of parts of sample	Falling	Yes/no	No	No	No	No
	Burning, duration of burning	(s)	---	---	---	---
Smoke Density	Maximum	(%)	2,8	2,9	2,5	2,7
	Reached after	(s)	95	103	112	103
	Integral	(% x min)	6,4	6,6	6,8	6,6
Destroyed Area	Length	(cm)	10	11	11	10,3
Fire on sample extinguished	Time	(s)	---	---	---	---
Burning through of the sample		Yes/no	---	---	---	---

Inflammability Class	S4
Smoke Development Class	SR2
Class of The Capacity of forming drops	ST2

- **Gas Concentrations and Smoke Toxicity**

**		Gas Concentrations							
Sampling Time		4 minutes				8 minutes			
# Sample		1	2	3	Avg	1	2	3	Avg
CO ₂	(mg/m ³)	2748	2960	2570	2759	11018	11943	10324	11095
CO	(mg/m ³)	38	44	29	37	63	127	97	95.66
HF	(mg/m ³)	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
HCl	(mg/m ³)	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
HBr	(mg/m ³)	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
HCN	(mg/m ³)	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
NO ₂	(mg/m ³)	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
SO ₂	(mg/m ³)	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
N.D = Not Detected									
CIT		0,005	0,005	0,005	0,006	0,03	0,03	0,03	0,03

$$FED(t_{zui}) = \frac{(CIT_4 + 0,5 * CIT_8) * 4 \text{ min} + CIT_8 * (t_{zui} - 8 \text{ min})}{30 \text{ min}} \leq 1$$

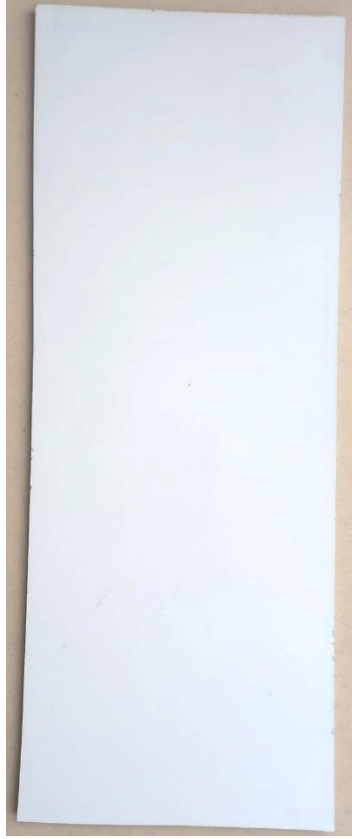
$$FED(15 \text{ min}) = \frac{4 * CIT_4 + 9 * CIT_8}{30}$$

$$FED(15, \text{determined}) = 0,033 < 1$$

$$FED(30 \text{ min}) = \frac{4 * CIT_4 + 24 * CIT_8}{30}$$

$$FED(30, \text{determined}) = 0,048 < 1$$

Sample Image



***** End of Report *****