

TEST REPORT

Order no: 17.01.2025

Signature: SL/Z-056/EN45545-R1/0060a/2025

Police, 29.01.2025

Test methods:

1. ISO 5658-2:2006/Amd. 1:2011. Reaction to fire tests – Spread of flame – Part 2: Lateral spread on building and transport products in vertical configuration.
2. EN-ISO 5659-2:2017. Plastic – Smoke generation – Part 2: Determination of optical density by a single – chamber test.
3. ISO 5660-1:2015/Amd.1:2019. Reaction to fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method).
4. EN 17084:2018. Railway applications – Fire protection of railway vehicles – Toxicity test of materials and components.
5. EN 45545-2:2020+A1:2023. Railway applications – Fire protection on railway vehicles – Part 2: Requirements for fire behavior of materials and components.

Content of request: Tests according to EN 45545-2:2020+A1:2023 - requirement R1, R7.

Sponsor: Continental Grafix AG
Lettenstrasse 2
6343 Rotkreuz
Switzerland

Material: panoRama X-Treme

Composition: Polymeric Vinyl Film

Manufacturer/supplier: Continental Grafix AG
Lettenstrasse 2
6343 Rotkreuz
Switzerland

Assessment: The tested product fulfils the requirements R1 and R7 according to EN 45545-2:2020+A1:2023 for hazard level HL1, HL2 and HL3.

The reprint and the copying: only with the agreement of Continental Grafix AG.

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Report applies only to the sample tested and is not necessarily indicative of the qualities of apparently identical or similar products.

Content of test report: eight pages with signature and numbers.

1. Spread of flame according to ISO 5658-2

Substrate: 1,0 mm steel plate.

Tested side: laminated foil side (white).

Table 1.1. Findings of critical heat flux at extinguishment CFE

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of the specimen	g	27,8	27,7	27,9	27,8	0,1
Specimen thickness	mm	0,1	0,1	0,1	0,1	0,0
Ignition time	s	19	23	19	20	2
Extinction time	s	211	167	133	170	39
Duration of the test	s	815	770	735	773	40
Flame-spread distance	mm	340	370	310	340	30
Critical heat flux at extinguishment CFE	kW·m ⁻²	25,2	21,6	28,9	25,2	3,7
Flaming particles or droplets	YES/NO	NO	NO	NO	NO	

Table 1.2. Time of the movement of the flame front

Distance from exposed of the specimen mm	Calibration flux levels at the specimen kW·m ⁻²	Time of arrival of the flame front		
		Specimen		
		1	2	3
		s		
50	50,5	32	32	32
100	48,5	37	35	34
150	46,4	41	41	38
200	41,4	63	61	50
250	36,4	85	82	69
300	30,2	103	86	120
350	23,9	-	121	-
400	18,2	-	-	-
450	12,5	-	-	-

Remarks: none.



Figure 1. Appearance of the specimens after the test

2. Smoke generation according to EN-ISO 5659-2 + EN 45545-2

Test conditions - irradiance of $50 \text{ kW} \cdot \text{m}^{-2}$

Table 2. Final findings of smoke generation

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of specimen	g	1,0	1,0	1,0	1,0	0,0
Specimen thickness	mm	0,1	0,1	0,1	0,1	0,0
Ignition time - t_z	s	-	-	-	-	-
Extinction time	s	-	-	-	-	-
Duration of the test	s	600	600	600	600	0
Maximum of specific optical density - $D_{s,max}$	-	46	47	58	50	7
Time of arrival of the maximum of $D_{s,max}$	s	272	240	588	367	192
Specific optical density in the first 4 min of the test - $D_s(4)$	-	45	47	48	47	1
Cumulative specific optical densities in the first 4 min of the test - VOF_4	min	86	95	97	93	6

Remarks: none.

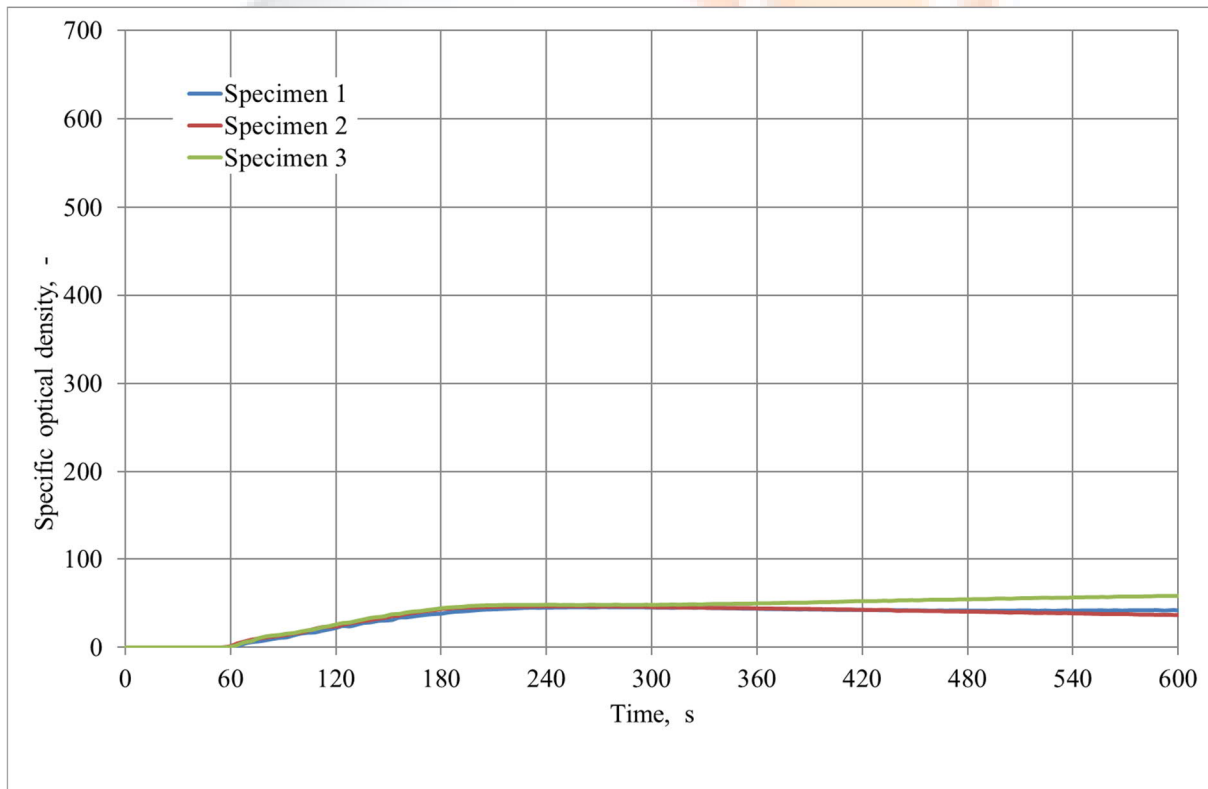


Figure 2. Specific optical density in the time

3. Results of toxic products emission of material decomposition and burning according to EN 17084, Method 1

Test conditions - irradiance of $50 \text{ kW} \cdot \text{m}^{-2}$

Table 3.1. Concentration of toxic products of material decomposition and burning after 4 min

Toxic component of burning products	Concentration of toxic products after 4 min				
	Specimen no.			Average	Standard deviation
	1	2	3		
	mg·m ⁻³				
CO ₂	293	390	416	366	65
CO	42	44	52	46	5
HCN	0	0	0	0	0
NO ₂	0	0	0	0	0
NO	0	0	0	0	0
HCL	164	247	210	207	41
SO ₂	0	0	0	0	0
HF	0	0	0	0	0
HBr	0	0	0	0	0

Table 3.2. Concentration of toxic products of material decomposition and burning after 8 min

Toxic component of burning products	Concentration of toxic products after 8 min				
	Specimen no.			Average	Standard deviation
	1	2	3		
	mg·m ⁻³				
CO ₂	1132	1132	1503	1256	214
CO	130	128	220	159	53
HCN	0	0	0	0	0
NO ₂	0	0	0	0	0
NO	0	0	0	0	0
HCL	138	229	142	170	51
SO ₂	0	0	0	0	0
HF	0	0	0	0	0
HBr	0	0	0	0	0

Table 3.3. Conventional index of toxicity

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Conventional index of toxicity CIT _G at 4 min	-	0,18	0,27	0,23	0,23	0,04
Conventional index of toxicity CIT _G at 8 min	-	0,16	0,25	0,17	0,19	0,05

Remarks: none.

4. Heat release rate of specimen according to ISO 5660-1

Test conditions - irradiance of $50 \text{ kW} \cdot \text{m}^{-2}$

Table 4. Heat release rate

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of the specimen	g	1,9	1,9	1,9	1,9	0,0
Specimen thickness	mm	0,1	0,1	0,1	0,1	0,0
Ignition time	s	32	40	38	37	4
Extinction time	s	76	100	96	91	13
Duration of the test	s	616	610	616	614	3
Maximum heat release rate	$\text{kW} \cdot \text{m}^{-2}$	88	75	80	81	7
Total heat release	$\text{MJ} \cdot \text{m}^{-2}$	3,3	2,9	3,3	3,2	0,2
Maximum average rate of heat emission MARHE	$\text{kW} \cdot \text{m}^{-2}$	34,1	26,5	29,4	30,0	3,8
Fire integrity acc. 5.2.2.2 EN 45545-2	YES/NO	YES	YES	YES	YES	-

Remarks: none.

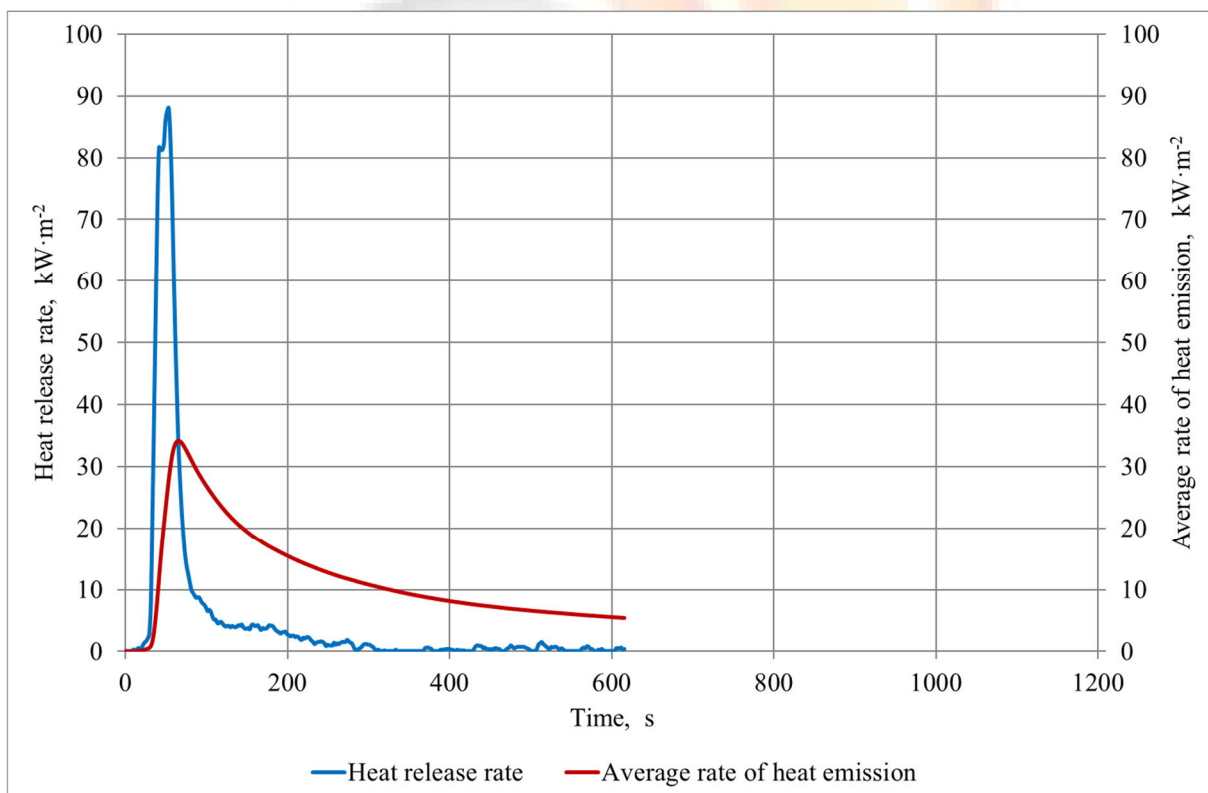


Figure 4.1. The relation of heat release rate and the time – specimen 1

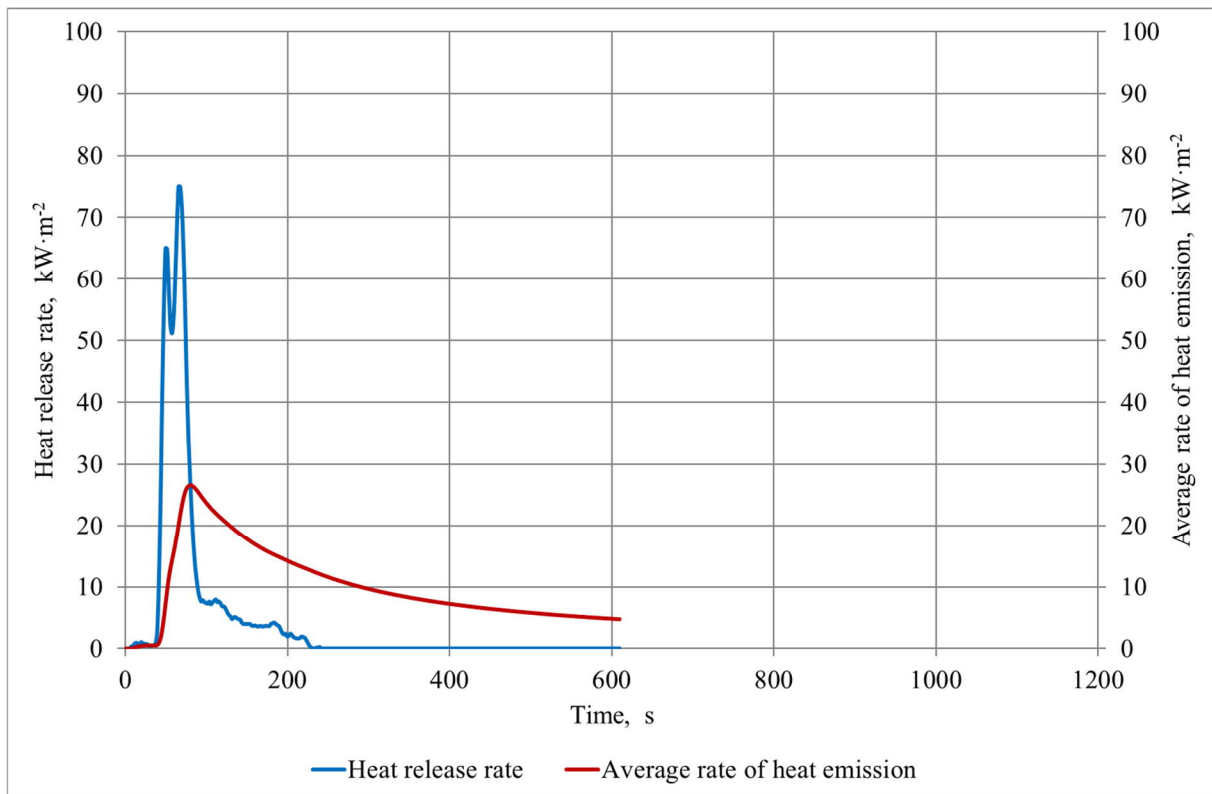


Figure 4.2. The relation of heat release rate and the time – specimen 2

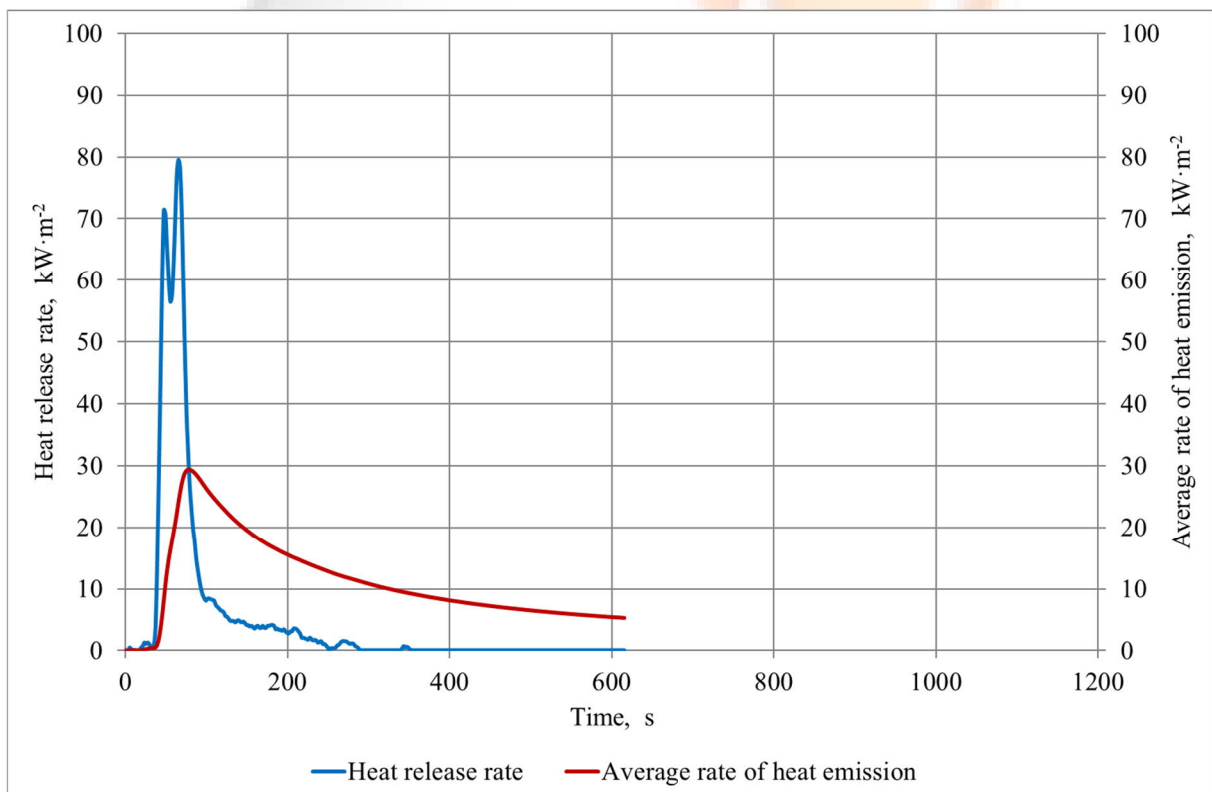


Figure 4.3. The relation of heat release rate and the time – specimen 3

5. Final findings

Requirement	Method/norm	Measured quantity	Unit	Measured value	Critical value			Crossing coefficient		
					HL1	HL2	HL3	HL1	HL2	HL3
R1	T02 ISO 5658-2	CFE	$\text{kW}\cdot\text{m}^{-2}$	25,2	20	20	20	0,79	0,79	0,79
	T03.01 ISO 5660-1: 50 $\text{kW}\cdot\text{m}^{-2}$	MARHE	$\text{kW}\cdot\text{m}^{-2}$	30,0	-	90	60	-	0,33	0,50
	T10.01 EN ISO 5659-2: 50 $\text{kW}\cdot\text{m}^{-2}$	$D_s(4)$	-	47	600	300	150	0,08	0,16	0,31
	T10.02 EN ISO 5659-2: 50 $\text{kW}\cdot\text{m}^{-2}$	VOF_4	min	93	1200	600	300	0,08	0,15	0,31
	T11.01 EN 17084 Method 1 50 $\text{kW}\cdot\text{m}^{-2}$	$CIT_G(4)$	-	0,23	1,2	0,9	0,75	0,19	0,25	0,30
		$CIT_G(8)$	-	0,19	1,2	0,9	0,75	0,16	0,21	0,26

The tested product fulfils the requirement R1 according to EN 45545-2:2020+A1:2023 for hazard level HL1, HL2 and HL3.

Requirement	Method/norm	Measured quantity	Unit	Measured value	Critical value			Crossing coefficient		
					HL1	HL2	HL3	HL1	HL2	HL3
R7	T02 ISO 5658-2	CFE	$\text{kW}\cdot\text{m}^{-2}$	25,2	20	20	20	0,79	0,79	0,79
	T03.01 ISO 5660-1: 50 $\text{kW}\cdot\text{m}^{-2}$	MARHE	$\text{kW}\cdot\text{m}^{-2}$	30,0	-	90	60	-	0,33	0,50
	T10.04 EN ISO 5659-2: 50 $\text{kW}\cdot\text{m}^{-2}$	$D_{s\text{max}}$	-	50	-	600	300	-	0,08	0,17
	T11.01 EN 17084 Method 1 50 $\text{kW}\cdot\text{m}^{-2}$	$CIT_G(4)$	-	0,23	-	1,8	1,5	-	0,13	0,15
		$CIT_G(8)$	-	0,19	-	1,8	1,5	-	0,11	0,13

The tested product fulfils the requirement R7 according to EN 45545-2:2020+A1:2023 for hazard level HL1, HL2 and HL3.

6. Remaining required information

Date of receipt of samples: 21.01.2025

Sampling: sponsor took and delivered samples.

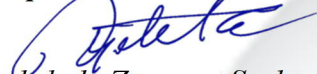
Description of the test material: white film (0,14 mm thick) with self-adhesive layer protected with a protective paper (0,14 mm thick), described as "panorama X-treme". Total thickness of 0,2-0,3 mm and weight per unit area 180-224 g/m² (without protective paper). Sponsor delivered one roll of 1370 mm width. Laboratory prepared samples for the test.

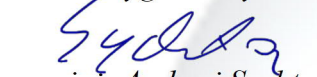
Conditioning of specimens: constant mass at a temperature of 23±2°C, and relative humidity of 50±5 %.

Declarations:

1. The test results relate to the behaviour 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 products in use.
2. The information provided on the first page of the report concerning the scope of research and identification of the tested object/objects were provided by the Sponsor.

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Date and place of test - 24.01.2025, Police

