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AB 1501

TEST REPORT

Order no: 81A31327 Signature: SL/Z-134/EN45545-R21/0131a/2025 Police, 19.02.2025

Tests methods:

1. EN ISO 5659-2:2017. Plastic – Smoke generation – Part 2: Determination of optical density by a single – chamber test.
2. 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).
3. EN 17084:2018. Railway applications – Fire protection of railway vehicles – Toxicity test of materials and components.
4. 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 R21.

Sponsor: Camira Transport Fabrics Ltd
Hopton Mils
Mirfield HD9 4 AY, United Kingdom

Material: 745 / 754 / 750 / 765 / SK33 / SK30 (Wired) + NitroPhlam365

Composition/specification:
Composition details:
Pile: 85% Wool, 15% Nylon
Ground: 100% Cotton
Batch Number: 559350 (200)
Pattern reference: DB325E
Fabric Type: Upholstery Fabric

Manufacturer/supplier: Camira Transport Fabrics Ltd
Hopton Mils
Mirfield HD9 4 AY, United Kingdom

Assessment: The tested product fulfils the requirement of R21 according to EN 45545-2:2020+A1:2023 for hazard level HL1, HL2 and HL3.

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

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

Tested side: from fabric side.

Test conditions - irradiance of 25 $kW \cdot m^{-2}$ with pilot flame.

Table 1.1. Final findings of smoke generation

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of specimen	g	15,9	16,3	16,4	16,2	0,3
Specimen thickness	mm	23,1	25,0	25,0	24,4	1,1
Ignition time - t_z	s	12	36	13	20	14
Extinction time	s	412	-	-	-	-
Duration of the test	s	600	600	600	600	0
Maximum of specific optical density - $D_s max$	-	28	32	38	32	5
Time of arrival of the maximum of $D_s max$	s	600	600	596	599	2
Specific optical density in the first 4 min of the test - Ds(4)	-	11	14	11	12	2
Cumulative specific optical densities in the first 4 min of the test - VOF_4	min	16	29	21	22	7

Remarks: none.

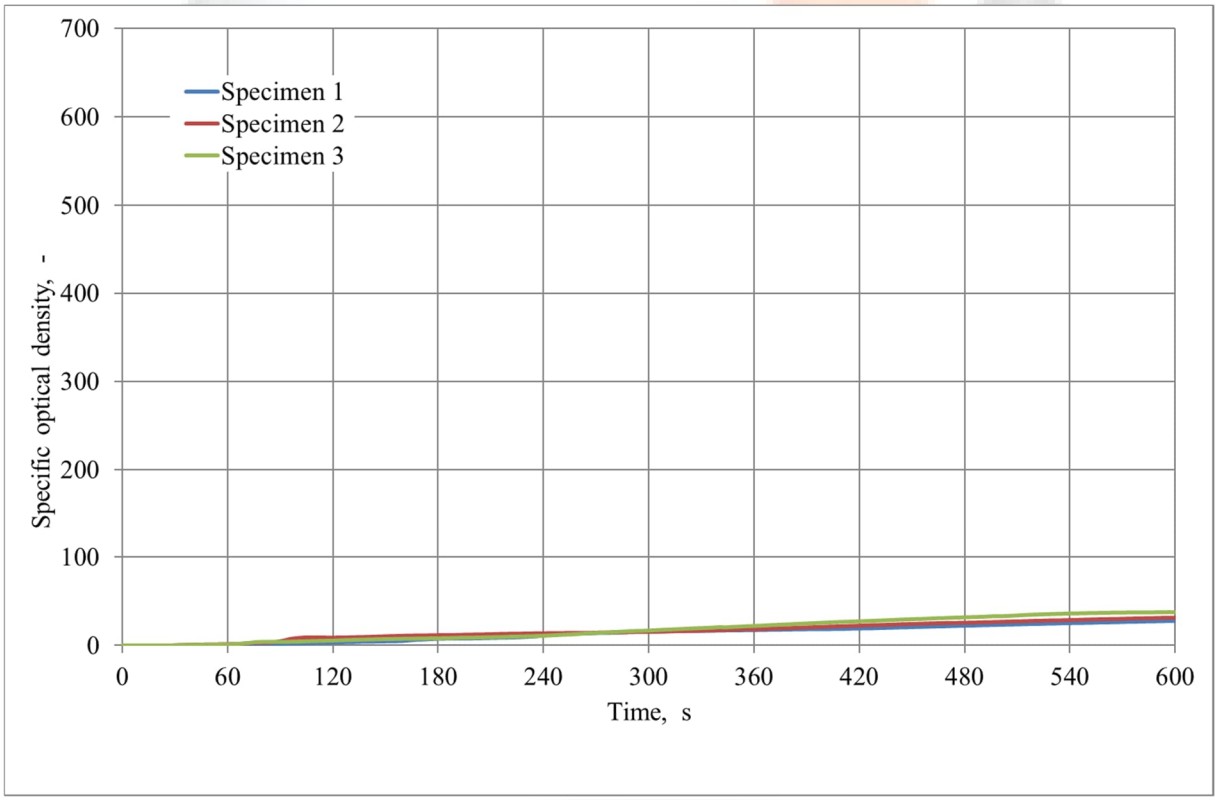

Figure 1.1. Specific optical density in the time

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

Test conditions - irradiance of 25 kW·m^{-2} with pilot flame.

Table 2.1. 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	3225	3145	3908	3426	419
CO	9	18	25	17	8
HCN	14	13	19	15	3
NO_2	3	0	0	1	2
NO	28	32	32	31	3
HCL	0	0	0	0	0
SO_2	114	116	121	117	4
HF	0	0	0	0	0
HBr	0	0	0	0	0

Table 2.2. 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	5462	5316	5051	5276	208
CO	45	53	76	58	16
HCN	21	23	25	23	2
NO_2	5	0	0	2	3
NO	38	46	40	41	4
HCL	0	0	0	0	0
SO_2	154	147	133	144	11
HF	0	0	0	0	0
HBr	0	0	0	0	0

Table 2.3. 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	-	0,13	0,13	0,14	0,13	0,01
Conventional index of toxicity CIT_G at 8 min	-	0,18	0,18	0,17	0,18	0,01

Remarks: none.

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

Test conditions - irradiance of 25 kW·m^{-2}

Table 3.1. Heat release rate

Name of measured quantity	Unit	Specimen			Average	Standard deviation
		1	2	3		
Mass of the specimen	g	51,0	50,7	57,9	53,2	4,0
Specimen thickness	mm	48,7	48,4	49,7	48,9	0,7
Ignition time	s	72	68	68	69	2
Extinction time	s	1010	-	-	-	-
Duration of the test	s	1200	1200	1200	1200	0
Maximum heat release rate	kW·m^{-2}	68	142	105	105	37
Total heat release	MJ·m^{-2}	20,4	29,6	18,8	22,9	5,8
Average of qA,180	kW·m^{-2}	31,4	47,6	39,6	39,5	8,1
Maximum average rate of heat emission MARHE	kW·m^{-2}	33,5	48,0	39,8	40,4	7,3
Fire integrity acc. 5.2.2.2 EN 45545-2	YES/NO	YES	YES	YES	YES	-

Remarks: none.

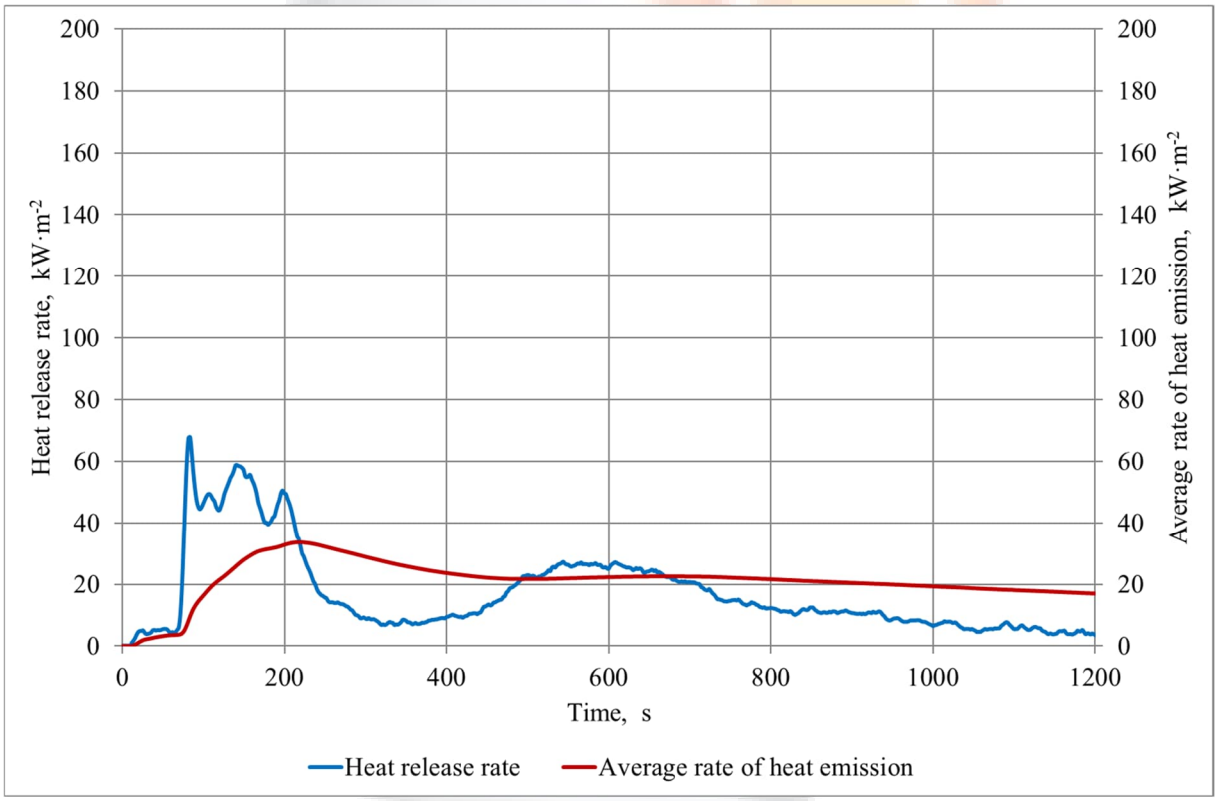

Figure 3.1. The relation of heat release rate and the time – specimen 1

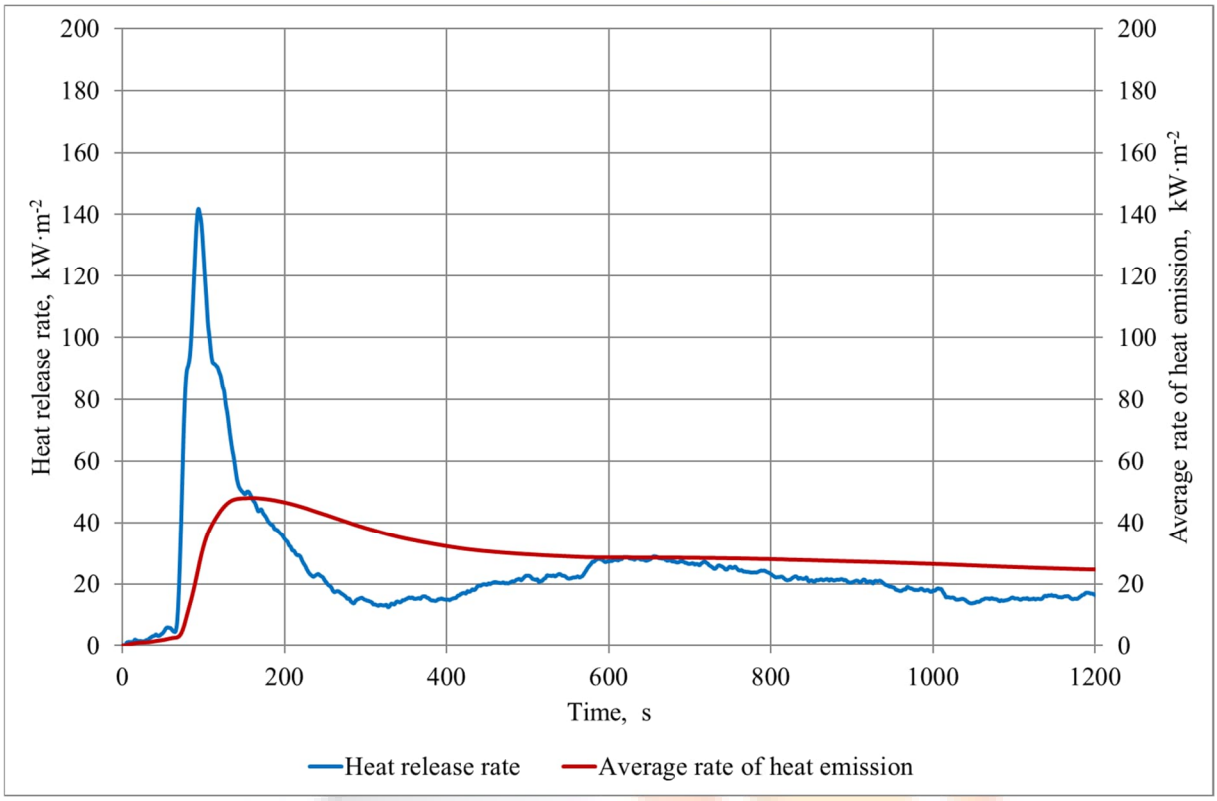

Figure 3.2. The relation of heat release rate and the time – specimen 2

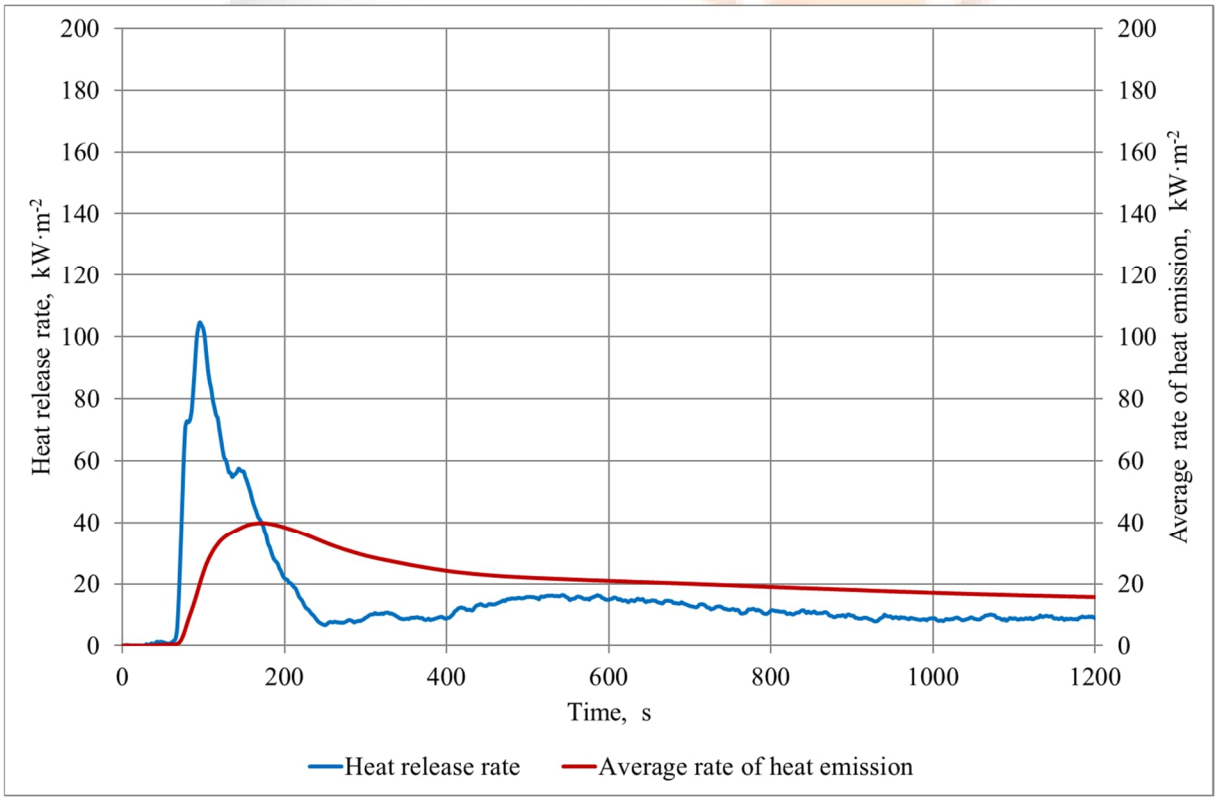

Figure 3.3. The relation of heat release rate and the time – specimen 3

Table 3.2 Heat release rate - specimens 4 to 6 (ISO 5660-1, Clause 11.3.7)

Name of measured quantity	Unit	Specimen			Average, specimens 1 to 6	Standard deviation specimens 1 to 6
		4	5	6		
Mass of the specimen	g	51,5	49,4	53,3	52,3	3,0
Specimen thickness	mm	48,3	47,8	49,4	48,7	0,7
Ignition time	s	76	68	140	82	29
Extinction time	s	255	350	328	724	459
Duration of the test	s	1200	1200	1200	1200	0
Maximum heat release rate	$kW \cdot m^{-2}$	81	118	55	95	33
Total heat release	$MJ \cdot m^{-2}$	10,6	13,1	8,5	16,8	7,8
Average of $q_{A,180}$	$kW \cdot m^{-2}$	26,8	37,6	5,1	31,3	14,7
Maximum average rate of heat emission MARHE	$kW \cdot m^{-2}$	27,0	38,8	14,5	33,6	11,7
Fire integrity acc. 5.2.2.2 EN 45545-2	YES/NO	YES	YES	YES	YES	-

Remarks: none.

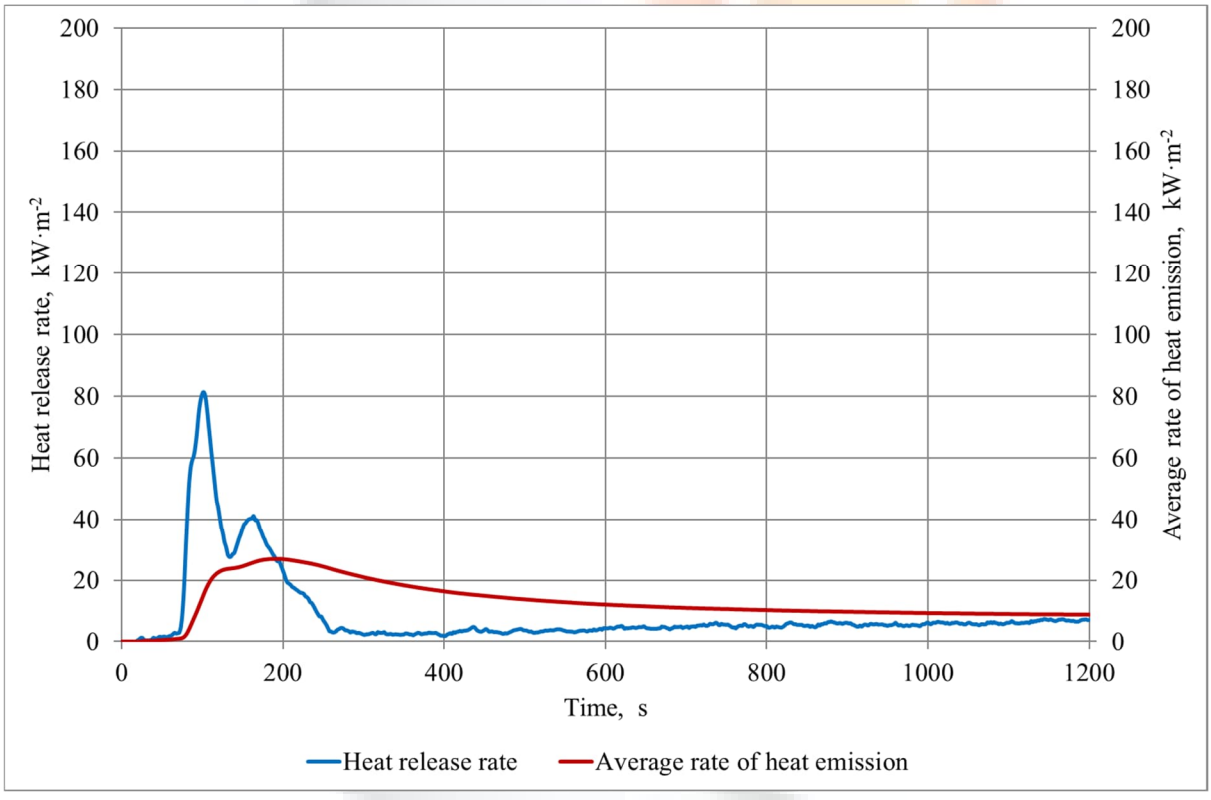

Figure 3.4. The relation of heat release rate and the time – specimen 4

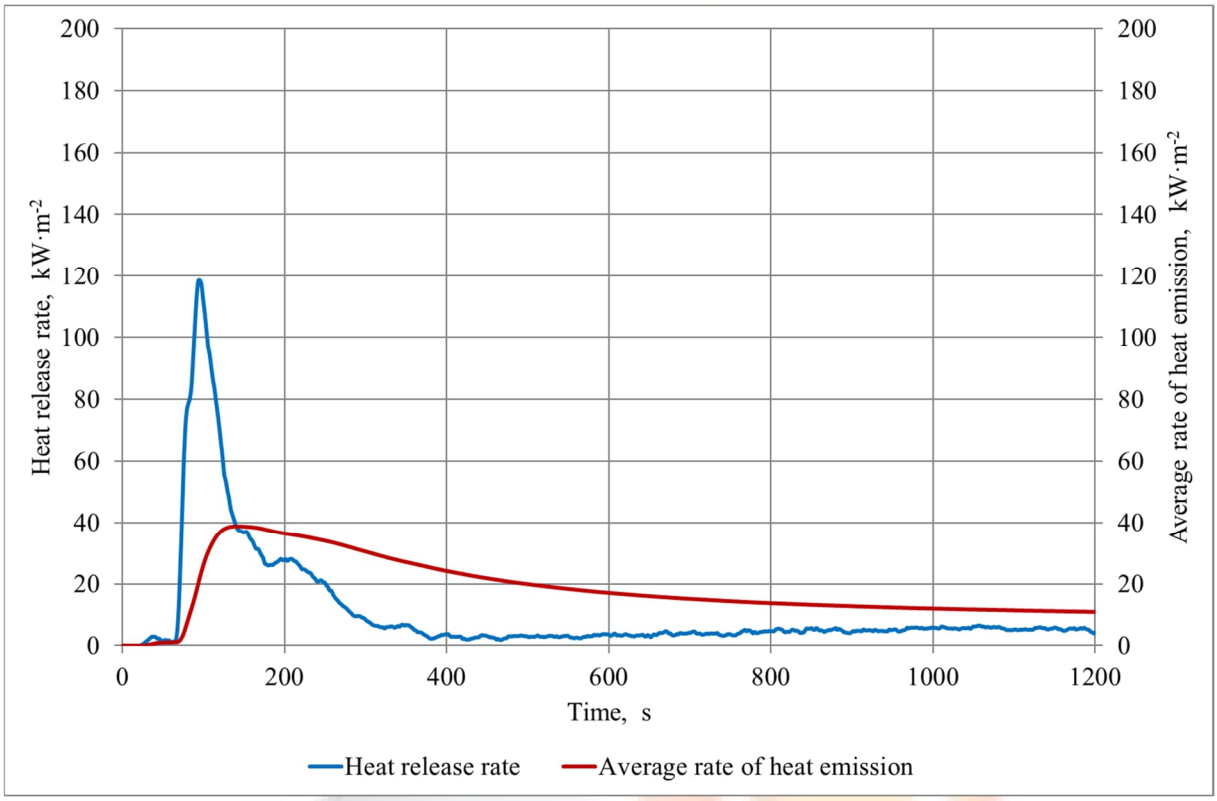

Figure 3.5. The relation of heat release rate and the time – specimen 5

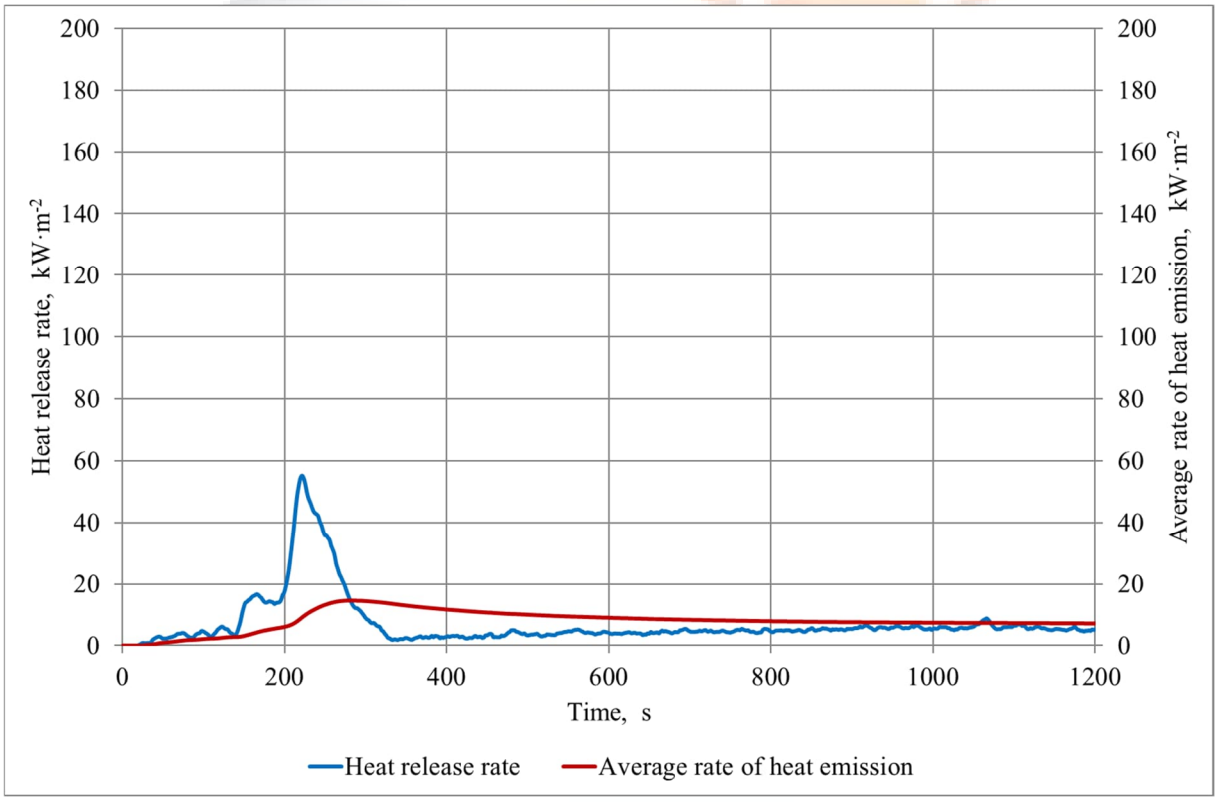

Figure 3.6. The relation of heat release rate and the time – specimen 6

4. Final findings

Requirement	Method/norm	Measured quantity	Unit	Measured value	Critical value			Crossing coefficient		
					HL1	HL2	HL3	HL1	HL2	HL3
R21	T03.02 EN ISO 5660-1: 25 kW·m^{-2}	MARHE	kW·m^{-2}	33,6	75	50	50	0,45	0,67	0,67
	T10.03 EN ISO 5659-2: 25 kW·m^{-2}	$D_s$max	-	32	300	300	200	0,11	0,11	0,16
	T11.02 EN 17084 Method 1 25 kW·m^{-2}	CIT_G (4)	-	0,13	1,2	0,9	0,75	0,11	0,15	0,17
		CIT_G (8)	-	0,18	1,2	0,9	0,75	0,15	0,20	0,24

The tested product fulfils the requirement of R21 according to EN 45545-2:2020+A1:2023 for hazard level HL1, HL2 and HL3.

5. Remaining required information

Date of receipt of samples: 10.02.2025

***Sampling*:** Sponsor took and delivered samples.

Description of the test material: upholstery set consisting of: patterned, in blue upholstery described " WIRED 200 " fabric 4 mm thick with a weight per unit area of 900-910 g/m^2 + white fireproof fabric ~0,2 mm thick with a weight per unit area of approx. 250 g/m^2 + and graphite foam with density approx. 92 kg/m^3. Sponsor delivered one piece of upholstery fabric with dimensions 725-735x660-680 mm, one piece of fireproof fabric with dimensions 690x1000 mm and one piece with dimensions 765x430 mm, 6 samples of graphite foam with dimensions 100x100x43-44 mm and 6 samples with dimensions 75x75x19-20 mm. Laboratory prepared the samples for testing.

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

Specimen preparation: according to Clause 7.5 of ISO 5660-1:2015+Amd:2019.

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.

Operators:

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dr inż. Krzysztof Sychta

Date and place of test - 13.02 and 14.02.2025, Police