

## TEST REPORT

Order no: 05.07.2024\_R.Christ Signature: SL/Z-811/EN45545-R1/0796a/2024 Police, 20.09.2024

### 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 and R7.

**Sponsor:** Continenta Grafix AG  
Lettenstrasse 2  
6343 Rotkreuz  
Switzerland

**Material:** panoRama / panoRama Innova / panoRama Cast

**Composition:** Perforated Self-adhesive vinyl film. Printable white front side and black back side / with an Ultra Clear Overlamine

**Manufacturer/supplier:** Continenta 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 Continenta Grafix AG.

Without the written consent of the Sychta Laboratory the report can be copied only in one piece.

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:** glass 4,0 mm thick.

**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                  | 27,9     | 27,8 | 27,7 | 27,8    | 0,1                |
| Specimen thickness                       | mm                 | 0,2      | 0,2  | 0,2  | 0,2     | 0                  |
| Ignition time                            | s                  | 30       | 28   | 34   | 31      | 3                  |
| Extinction time                          | s                  | 146      | 109  | 123  | 126     | 19                 |
| Duration of the test                     | s                  | 750      | 710  | 725  | 728     | 20                 |
| Flame-spread distance                    | mm                 | 270      | 250  | 290  | 270     | 20                 |
| Critical heat flux at extinguishment CFE | kW·m <sup>-2</sup> | 33,9     | 36,4 | 31,4 | 33,9    | 2,5                |
| 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 | Calibration flux levels at the specimen | Time of arrival of the flame front |     |    |
|---------------------------------------|-----------------------------------------|------------------------------------|-----|----|
|                                       |                                         | Specimen                           |     |    |
| mm                                    | kW·m <sup>-2</sup>                      | 1                                  | 2   | 3  |
| 50                                    | 50,5                                    | 52                                 | 52  | 51 |
| 100                                   | 48,5                                    | 57                                 | 55  | 59 |
| 150                                   | 46,4                                    | 67                                 | 64  | 64 |
| 200                                   | 41,4                                    | 76                                 | 79  | 76 |
| 250                                   | 36,4                                    | 95                                 | 103 | 94 |
| 300                                   | 30,2                                    | -                                  | -   | -  |
| 350                                   | 23,9                                    | -                                  | -   | -  |
| 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    | 1,2      | 1,2 | 475,4 | 159,3   | 273,7              |
| Specimen thickness                                                             | mm   | 0,2      | 0,2 | 0,2   | 0,2     | 0                  |
| Ignition time - $t_z$                                                          | s    | 41       | -   | 41    | -       | -                  |
| Extinction time                                                                | s    | 78       | -   | 51    | -       | -                  |
| Duration of the test                                                           | s    | 600      | 600 | 600   | 600     | 0                  |
| Maximum of specific optical density - $D_{s,max}$                              | -    | 83       | 94  | 80    | 85      | 7                  |
| Time of arrival of the maximum of $D_{s,max}$                                  | s    | 344      | 296 | 296   | 312     | 28                 |
| Specific optical density in the first 4 min of the test - $D_s(4)$             | -    | 78       | 92  | 79    | 83      | 7                  |
| Cumulative specific optical densities in the first 4 min of the test - $VOF_4$ | min  | 188      | 197 | 187   | 191     | 5                  |

**Remarks:** none.

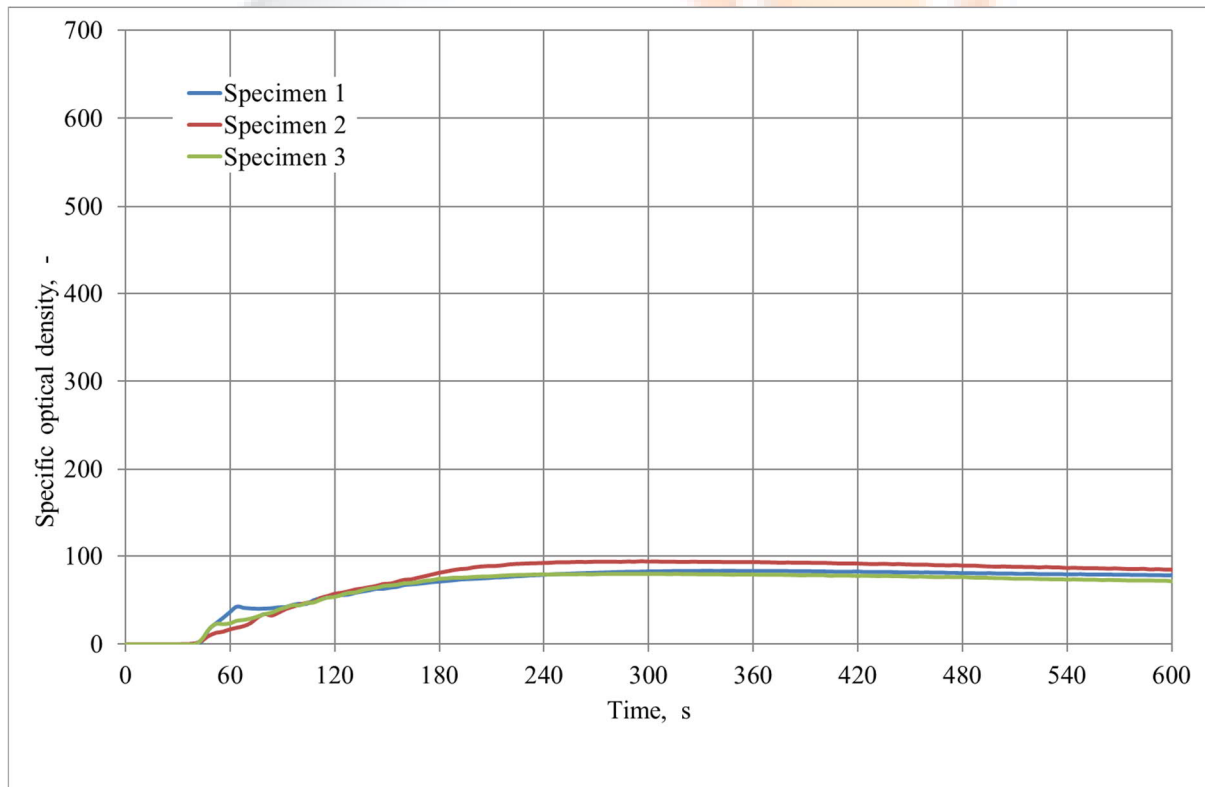


Figure 2. Specific optical density in the time

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

Test conditions - irradiance of 50 kW·m<sup>-2</sup>

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

| Toxic component<br>of burning<br>products | Concentration of toxic products after 4 min |     |     |         |                       |
|-------------------------------------------|---------------------------------------------|-----|-----|---------|-----------------------|
|                                           | Specimen no.                                |     |     | Average | Standard<br>deviation |
|                                           | 1                                           | 2   | 3   |         |                       |
|                                           | mg·m <sup>-3</sup>                          |     |     |         |                       |
| CO <sub>2</sub>                           | 821                                         | 271 | 508 | 534     | 276                   |
| CO                                        | 45                                          | 39  | 52  | 46      | 7                     |
| HCN                                       | 0                                           | 0   | 0   | 0       | 0                     |
| NO <sub>2</sub>                           | 0                                           | 0   | 0   | 0       | 0                     |
| NO                                        | 0                                           | 0   | 0   | 0       | 0                     |
| HCL                                       | 0                                           | 0   | 0   | 0       | 0                     |
| SO <sub>2</sub>                           | 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<br>of burning<br>products | Concentration of toxic products after 8 min |     |     |         |                       |
|-------------------------------------------|---------------------------------------------|-----|-----|---------|-----------------------|
|                                           | Specimen no.                                |     |     | Average | Standard<br>deviation |
|                                           | 1                                           | 2   | 3   |         |                       |
|                                           | mg·m <sup>-3</sup>                          |     |     |         |                       |
| CO <sub>2</sub>                           | 1203                                        | 719 | 895 | 939     | 245                   |
| CO                                        | 159                                         | 189 | 186 | 178     | 17                    |
| HCN                                       | 0                                           | 0   | 0   | 0       | 0                     |
| NO <sub>2</sub>                           | 0                                           | 0   | 0   | 0       | 0                     |
| NO                                        | 0                                           | 0   | 0   | 0       | 0                     |
| HCL                                       | 0                                           | 0   | 0   | 0       | 0                     |
| SO <sub>2</sub>                           | 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 <sub>G</sub> at 4 min | -    | 0,00     | 0,00 | 0,00 | 0,00    | 0,00               |
| Conventional index of toxicity CIT <sub>G</sub> at 8 min | -    | 0,01     | 0,01 | 0,01 | 0,01    | 0,00               |

**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                               | 2,2      | 2,3  | 2,2  | 2,3     | 0,1                |
| Specimen thickness                          | mm                              | 0,2      | 0,2  | 0,2  | 0,2     | 0                  |
| Ignition time                               | s                               | 36       | 36   | 34   | 35      | 1                  |
| Extinction time                             | s                               | 66       | 72   | 58   | 65      | 7                  |
| Duration of the test                        | s                               | 1200     | 1200 | 1200 | 1200    | 0                  |
| Maximum heat release rate                   | $\text{kW} \cdot \text{m}^{-2}$ | 60       | 65   | 70   | 65      | 5                  |
| Total heat release                          | $\text{MJ} \cdot \text{m}^{-2}$ | 2,1      | 2,4  | 3,2  | 2,6     | 0,6                |
| Maximum average rate of heat emission MARHE | $\text{kW} \cdot \text{m}^{-2}$ | 20,4     | 21,9 | 22,4 | 21,6    | 1,0                |
| Fire integrity acc. 5.2.2.2 EN 45545-2      | YES/NO                          | YES      | YES  | YES  | YES     | -                  |

**Remarks:** none.

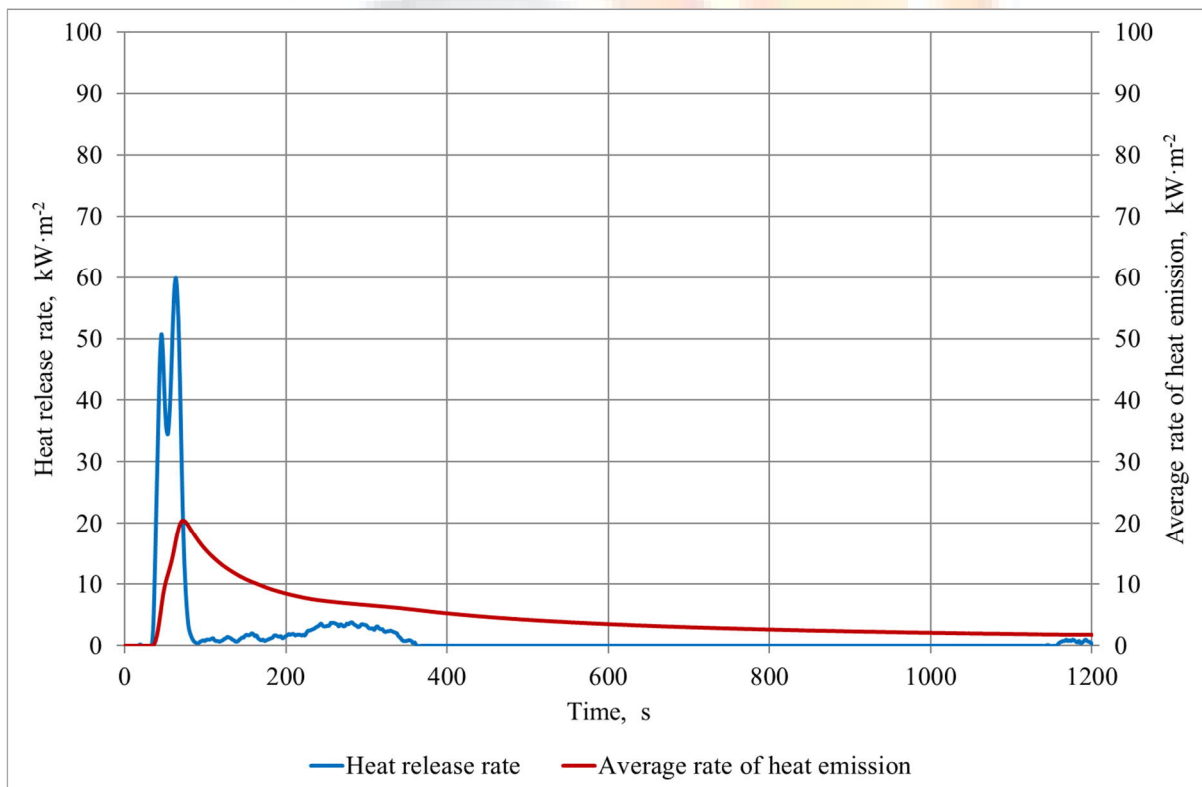


Figure 4.1. The relation of heat release rate and the time – specimen 1

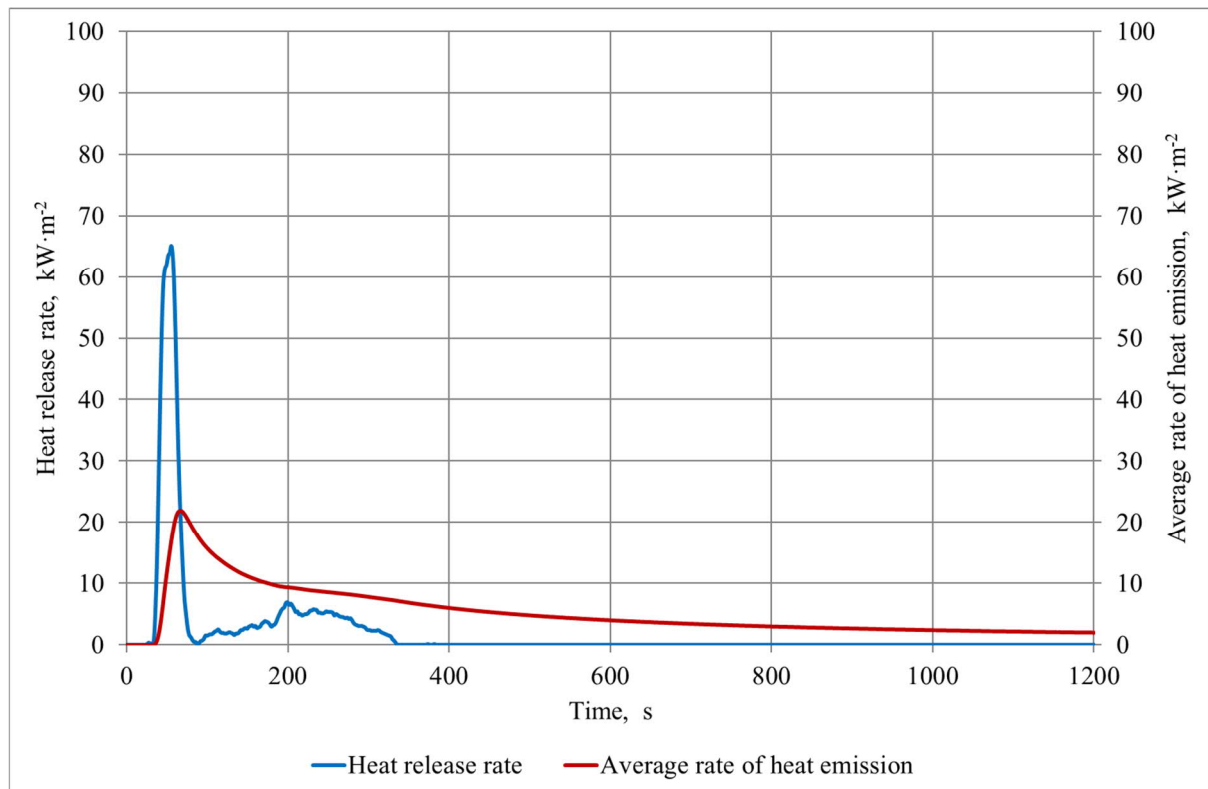


Figure 4.2. The relation of heat release rate and the time – specimen 2

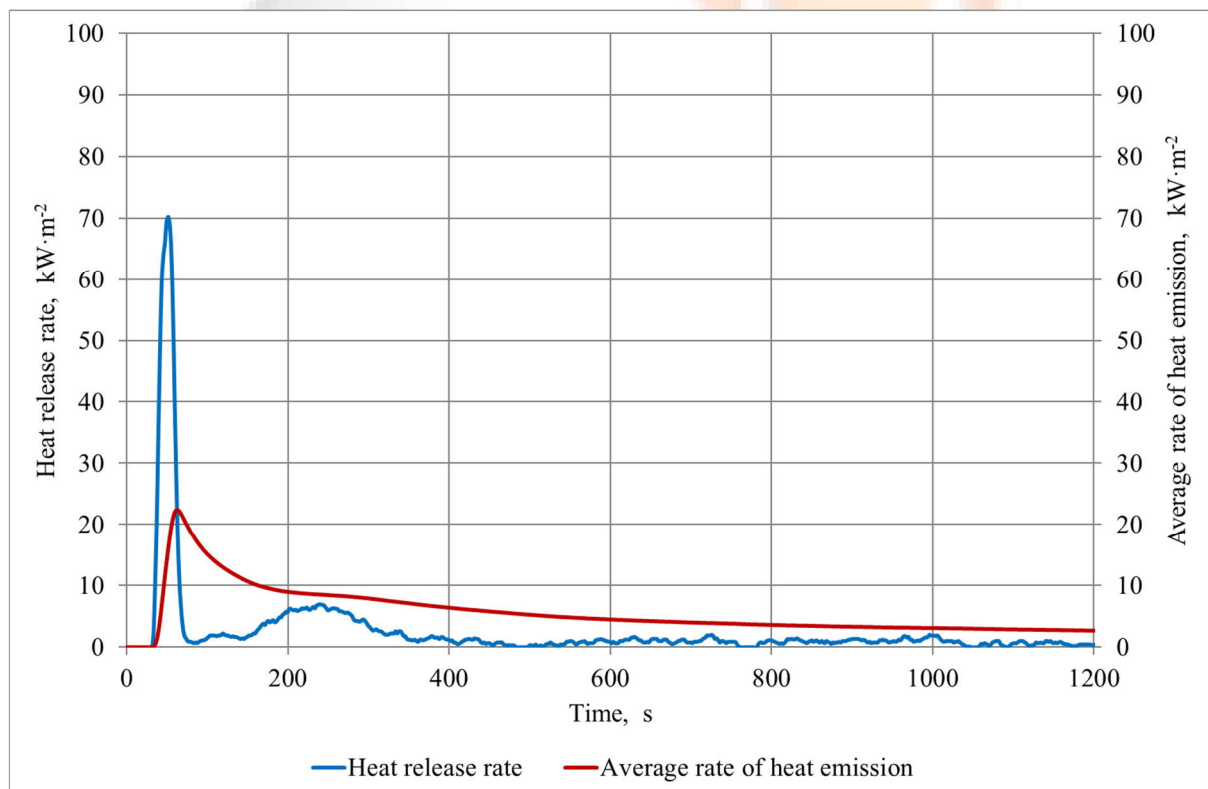


Figure 4.3. The relation of heat release rate and the time – specimen 3

## 5. Final findings

| Requirement | Method/norm                                          | Measured quantity    | Unit               | Measured value | Critical value |     |      | Crossing coefficient |      |      |
|-------------|------------------------------------------------------|----------------------|--------------------|----------------|----------------|-----|------|----------------------|------|------|
|             |                                                      |                      |                    |                | HL1            | HL2 | HL3  | HL1                  | HL2  | HL3  |
| R1          | T02<br>ISO 5658-2                                    | CFE                  | kW·m <sup>-2</sup> | 33,9           | 20             | 20  | 20   | 0,59                 | 0,59 | 0,59 |
|             | T03.01<br>ISO 5660-1:<br>50 kW·m <sup>-2</sup>       | MARHE                | kW·m <sup>-2</sup> | 21,6           | -              | 90  | 60   | -                    | 0,24 | 0,36 |
|             | T10.01<br>EN ISO 5659-2:<br>50 kW·m <sup>-2</sup>    | D <sub>s</sub> (4)   | -                  | 83             | 600            | 300 | 150  | 0,14                 | 0,28 | 0,55 |
|             | T10.02<br>EN ISO 5659-2:<br>50 kW·m <sup>-2</sup>    | VOF <sub>4</sub>     | min                | 191            | 1200           | 600 | 300  | 0,16                 | 0,32 | 0,64 |
|             | T11.01<br>EN 17084 Method 1<br>50 kW·m <sup>-2</sup> | CIT <sub>G</sub> (4) | -                  | 0,00           | 1,2            | 0,9 | 0,75 | 0,00                 | 0,00 | 0,00 |
|             |                                                      | CIT <sub>G</sub> (8) | -                  | 0,01           | 1,2            | 0,9 | 0,75 | 0,01                 | 0,01 | 0,02 |

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<br>ISO 5658-2                                    | CFE                  | kW·m <sup>-2</sup> | 33,9           | 20             | 20  | 20  | 0,59                 | 0,59 | 0,59 |
|             | T03.01<br>ISO 5660-1:<br>50 kW·m <sup>-2</sup>       | MARHE                | kW·m <sup>-2</sup> | 21,6           | -              | 90  | 60  | -                    | 0,24 | 0,36 |
|             | T10.04<br>EN ISO 5659-2:<br>50 kW·m <sup>-2</sup>    | D <sub>s</sub> max   | -                  | 85             | -              | 600 | 300 | -                    | 0,14 | 0,28 |
|             | T11.01<br>EN 17084 Method 1<br>50 kW·m <sup>-2</sup> | CIT <sub>G</sub> (4) | -                  | 0,00           | -              | 1,8 | 1,5 | -                    | 0,00 | 0,00 |
|             |                                                      | CIT <sub>G</sub> (8) | -                  | 0,01           | -              | 1,8 | 1,5 | -                    | 0,01 | 0,01 |
|             |                                                      |                      |                    |                |                |     |     |                      |      |      |

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:** 09.09.2024

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

**Description of the test material:** Perforated white self-adhesive film laminated on the top side with a transparent, glossy and rigid overlamine, self-adhesive side in black (~0,26 mm thick), laid on a white rigid, security film with a thickness of approx. 0,25 mm), total thickness approx. 0,51 mm and weight per unit area approx. 220 g/m<sup>2</sup> (without substrate). Marked: "panoRama Innova 40UV". Sponsor delivered 1 roll of 1370 mm width. The laboratory prepared the samples.

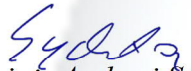
**Conditioning of specimens:** constant mass at a temperature of 23±2°C, and relative humidity of 50±5 %.

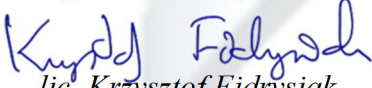
### Declarations:

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.

### Operators:

  
dr hab. Zygmunt Sychta

  
mgr inż. Andrzej Sychta

  
lic. Krzysztof Fidrysiak

### Authorised by:

  
KIEROWNIK TECHNICZNY  
dr inż. Krzysztof Sychta

SYCHTA LABORATORIUM Sp. J.  
72-010 Police, ul. Ofiar Stutthofu 90  
tel./fax +48 91 4210 214, tel. 502078855  
e-mail: biuro@sychta.eu www:sychta.eu  
KRS 0000387681 REGON 321023120  
NIP 8513152392

Date and place of test - 17.09.2024, Police

