



TESTING THE WORLD  
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## Summary report no. P60-18-8112en

Fire testing

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This report consists of  
2 page(s) and 0 enclosure(s).

Fon: 03302 49982 60

**Delivery date specimen:** 24.09.2018

**Test date:** From 28.09.2018 to 12.10.2018


**Test specimen:** OneWayVision Window Film panoRama / panoRama Innova

**Test specification:** Test methods of requirement set R7 according to  
DIN EN 45545-2 (02/2016) „Railway applications – Fire protection on  
railway vehicles – Part 2: Requirements for fire behavior of materials  
and components“

**Objective:** Evaluation according to DIN EN 45545-2 (02/2016)  
Requirement set R7 (see table 5 – Set of material requirements)

**Test results:** **With the obtained test results, the material reached for the  
requirement R7 the Hazard Level 3 (HL3).**

**Remark:** The classification is valid only in conjunction with the test reports listed  
on page 2. Please refer to the test reports for details.

  
**Stefan Harder**  
Head of Fire Lab

The results refer only to the specimens mentioned above.

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## 1 Details about the specimens

### Material or combination of materials:

OneWayVision Window Film panoRama / panoRama Innova  
glued on approx. 4mm glass

### Manufacturer:

Continental Grafix AG  
Bahnhof-Park 3  
6340 Baar  
Switzerland

### Dimensions of sample:

#### Ref. test methods:

T02	795mm x 150mm x 3,9mm
T03.01	100mm x 100mm x 4,0mm
T10.04, T11.01	75mm x 75mm x 4,0mm

### Side of specimen to be tested by flame:

foiled side

## 2 Summary of results

The material was tested for use in railway vehicles, requirement set R7 (Table 5 DIN EN 45545 2).

Test report no.	Reference method	Standard	Parameter	Unit	Result	HL
P60-18-0623	T02	ISO 5658-2	CFE	kW/m <sup>2</sup>	44,6	3
P60-18-5352	T03.01	ISO 5660-1	MARHE	kW/m <sup>2</sup>	9,2	3
P60-18-4378	T10.04	ISO 5659-2	Ds max	dimensionless	85	3
P60-18-3480	T11.01	ISO 5659-2	CIT	dimensionless	0,36	3
<b>Product classification</b>	-	EN 45545-2	-	-	-	HL3

The Hazard Level HL depends on the operation category and design category according to DIN EN 45545-2 Table 1.

Operation category	Design category			
	N: Standard vehicles	A: Automatic vehicles having no emergency trained staff on board	D: Double decked vehicle	S: Sleeping and couchette cars double decked or single deck
1	HL1	HL1	HL1	HL2
2	HL2	HL2	HL2	HL2
3	HL2	HL2	HL2	HL3
4	HL3	HL3	HL3	HL3

# European Union Fire testing of materials and components for trains - EN 45545-2

EN 45545-2 defines a classification system that specifies requirements for fire behavior of materials and products used in trains.

The system has been prepared by Technical Committee CEN/TC 256 "Railway applications" on behalf of the European Commission and is based on the requirements of the EU Directive 2008/57/EC.

EN 45545-2 classifies all material on board in different [groups](#) which have to fulfill specific "Requirement Sets" which often includes several test methods. The test methods included in each Requirements Set are shown in the picture below (click on picture for larger).



EN 45545, Table 5 "Material requirement sets"

Test Methods	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15	R16	R17	R18	R19	R20	R21	R22	R23	R24	R25	R26
ISO 5658-2	X	X	X	X			X				X	X					X									
EN ISO 5659-2	50*	50*	50*	50*	25**	50*	50*	25**	25**	25**	50*	50*					50*			25**	25**	25**	25**			
ISO 5660-1	50*	50*	50*		25**	50*	50*	25**	25**	25**	50*	50*					50*			25**	25**	25**				
EN ISO 9239-1								X		X																
EN ISO 11925-2	X <sup>a</sup>	X <sup>a</sup>	X <sup>a</sup>	X	X		X <sup>a</sup>				X <sup>a</sup>	X <sup>a</sup>					X <sup>a</sup>									
ISO/TR 9705-2																		X								
EN ISO 4589-2																						X	X	X		
EN 13501-1													X													
ISO 2592/ISO 2719														X												
EN 60332-1-2															X	X										
EN 60332-3-24 or															X	X										
EN 50305 <sup>b</sup>															X	X										
EN 61034-2															X	X										
EN 60695-2-11																									X	
EN 60695-11-10																										X
NF X 70-100-1/-2																						X	X			
EN ISO 12952-2																				X						<b>RI SE</b>

<sup>a</sup> Supplementation when, tested in accordance with ISO 5658-2, flaming droplets occur or test result is reported as unclassifiable.

<sup>b</sup> Depending on diameter, EN 60332-3-24 for  $d \geq 12$  mm, EN 50305 for  $d < 12$  mm.

\* Irradiance level  $50 \text{ kW/m}^2$ , for EN ISO 5659-2 test is conducted without pilot flame.

\*\* Irradiance level  $25 \text{ kW/m}^2$ , for EN ISO 5659-2 test is conducted with pilot flame.



## Information about ISO 5658-2 Flame Spread

**ISO 5658-2, Flame spread laterally on vertically mounted products**



### Main use

The method is included in EN 45545-2 for products used on trains. It's also used by IMO (International Maritime Organization) for products on ships, see [IMO 2010 FTP code, part 5](#).

In the method, the radiation level at the position where the flame front on the center line extinguishes is measured.

Examples of products that can be tested in this method  
Building products in trains or ships such as flooring, finishes (walls and ceilings).

### Specimens required for testing

Complete test	6 specimens, 795 mm x 155 mm. Maximum thickness 50 mm.
Indicative test	2 specimens, 795 mm x 155 mm. Maximum thickness 50 mm.

### Procedure for the test

The specimen is mounted in the specimen holder in combination with a substrate. It is vertically positioned during test and exposed to heat radiation from a radiation panel. The test is conducted with a pilot flame.

The time when the specimen is ignited is noted and the time when the flame reaches every 50 mm station along the specimen is noted. Time to flame out of the flame front on the center line, burnt length and any occurrence of burning droplets are noted. Three trials are performed.

### Related Information

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The RISE institutes SP, Innventia and Swedish ICT have merged in order to become a stronger research and innovation partner for businesses and society. During 2017 sp.se will be one of several websites within RISE. Please visit [ri.se](http://ri.se) for more information about RISE.



## ISO 5660-1 & 2 Cone calorimeter

**ISO 5660-1 & 2 – Cone calorimeter, heat release and smoke production.**



### Areas of use

The test method is used for fire technical modelling. The data from the test results can be used for modelling bigger fires. A fire sequence in the ISO 9705 – Room Corner Test and EN 13823 – SBI can for example be predicted using the ISO 5660 method. The cone calorimeter test is also largely used when testing products that are under development. A whole range of different data can be compared in order to eliminate products that will not have the sufficient fire characteristics.

The following parameters are measured when testing according to ISO 5660, heat release rate (kW/m<sup>2</sup>), total heat release (MJ/m<sup>2</sup>), mass loss (g/s), effective net heat of combustion (MJ/kg) and smoke production rate (m<sup>2</sup>/s). Levels of toxic gases can also be measured with FTIR analysis.

The test method is also used for third party verification (production control).

### Example of products that can be tested according to this method

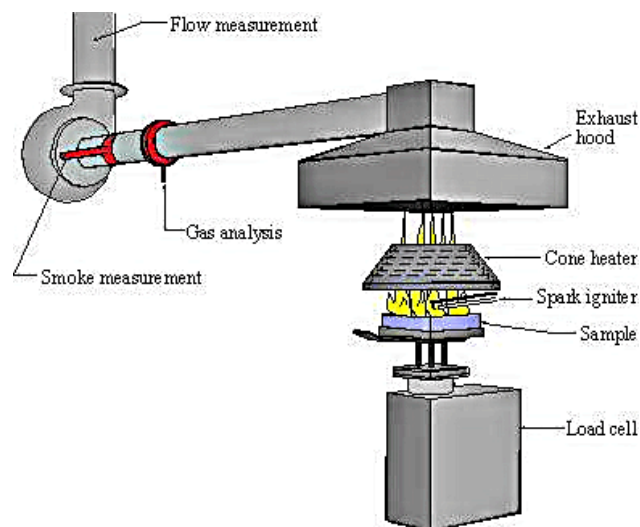
Building products, furnishings, cables, marine products, railway products, etc

### Material needed when testing

Complete test series, 3 tests	6 specimens with dimensions 100 mm x 100 mm. Maximum thickness 50 mm.
Single indicative test	2 specimens with dimensions 100 mm x 100 mm. Maximum thickness 50 mm.

### Test procedure

When testing a product according to ISO 5660, a sample with the dimension 100 mm x 100 mm is subjected to a specific irradiance level. The surface of the sample is heated and starts to emit pyrolysis gases that ignite by a spark igniter. The emitted gases are collected in a hood and transported away through a ventilation system. The heat release is measured using the data on measured oxygen concentration in the emitted smoke. The smoke production is measured continually throughout the test with a laser system.



### Related Information

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## ISO 5659-2 Smoke production

**ISO 5659-2, determination of the optical density of smoke produced from a horizontally positioned test specimen subjected to a specific thermal radiation in a sealed chamber.**



### Areas of use

The test method measures the ability of a specific material to emit smoke in case of a fire. The test is intended primarily for use in research and development and in fire safety engineering of buildings, trains, ships, etc.

The test method is, among others, invoked by EN 45545-2 for products used on trains and IMO 2010 FTP Code part 2 (International maritime Organisation) for products used on ships.

The results from testing according to ISO 5659-2 can be used when applying for a certificate according to rules of approval in the International Code for Application of Fire Test Procedures (Resolution MSC. 307(88)). An additional test method is IMO 2010 FTP Code part 5.

The test method ISO 5659-2 with additional toxicity analysis (FTIR) corresponds to the IMO Resolution MSC 307 (88) Annex 1, Part 2.

The test method is also invoked by the aircraft and train industries.

### Exempel of products that can be tested according to this method

The method is used when testing products which are predominantly used on ships and trains, but also on aircrafts, for example plastics, rubbers, textiles, painted surfaces, wood or other building materials

### Material needed when testing

EN 45545-2

Full test series, 3 tests	6 specimens with the dimension 75 mm x 75 mm, Maximum thickness 25 mm
One indicative test	2 specimens with the dimension 75 mm x 75 mm, Maximum thickness 25 mm

IMO 2010 FTP Code part 2

Full test series, 9 tests	12 specimens with the dimension 75 mm x 75 mm, Maximum thickness 25 mm
One indicative test, one irradiance level	2 specimens with the dimension 75 mm x 75 mm, Maximum thickness 25 mm

### Test procedure

The test is conducted in a sealed chamber. The test sample is placed horizontally and subjected to thermal radiance. When the specimen is subjected to the irradiance it starts to emit smoke which is collected in the chamber. The smoke's specific optical density (transparency) is measured with a light source and a photo cell. In the case of doing the toxicity analysis, some of the produced smoke is taken out of the chamber for analysis. Analysis is performed for each of the three irradiance levels and amongst others the following substances can be detected through FTIR analysis: Carbon monoxide, Hydrochloric acid, Hydrogen bromide, Hydrogen fluoride, Hydrogen cyanide, Nitrous oxides and Sulphur dioxide.

## Related Information

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