

Fraunhofer Institute for Wood Research
Wilhelm-Klauditz-Institut WKI

Director
Prof. Dr. Bohumil Kasal

Bienroder Weg 54 E
38108 Braunschweig | Germany

Nicole Schulz

Material Analysis & Indoor Chemistry
Phone + 49 531 2155-337 | Fax + 49 531 2155-905
sample_info@wki.fraunhofer.de
www.wki.fraunhofer.de

Fraunhofer WKI | Bienroder Weg 54 E | 38108 Braunschweig | Germany

Berkvens BV
Attn: Herr Joost Baerselman
Kanaaldijk Noord 24

Postbus 2
5710 AA Someren
Niederlande - Netherlands

Braunschweig, 07.04.2021

Test report No. MAIC-2021-0857

(This is a re-evaluation of results reported in MAIC-2019-4562)

Customer:	Berkvens BV, Someren.	
Objective of the test:	Testing and evaluation of a door sample according to the criteria of the Blue Angel DE-UZ 176, the AgBB-scheme and the French regulation 'ARRÊTÉ relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils'.	
Contents:	1. Sample description	Page 2
nicht definiert.	2. Methods	Page Fehler! Textmarke
nicht definiert.	3. Results	Page Fehler! Textmarke

This report comprises 8 pages.

The test report may be made available or duplicated only in its unabridged form. Publication in excerpt form is subject to the written consent of the Fraunhofer Institute for Wood Research – Wilhelm-Klauditz-Institut (WKI). The test results refer solely to the objects tested. The tested material was used up.

Sample description:

WKI no.	Date of reception	Sample Name (this information is provided by the customer)	Product No.	Manufacturer-Code	Date-Stamp
P79262	23.10.2019	Door	n.a.	n.a.	n.a.

(Sample P79262: foil/wrapped separately, wrapping ok)

Notice: Sample material will be stored for 2 months after test report date. Please contact us if an extended storage time is required or if sample material needs to be returned. Sample material for emission tests cannot be retained for repeated tests, it will only be stored for identification and documentation purposes.


Methods:

Sample preparation: Directly after unwrapping the door sample was prepared for the emission tests: A piece of the door sample (0.28 m²) was cut out. The freshly cut edge was sealed with a low emitting adhesive aluminum tape. The prepared sample was then placed upright in a 1m³ glass chamber on the sealed edge during the entire testing time.

Chamber emission test: The sample was tested in an emission test chamber without prior conditioning. After defined times (3, 7 and 28 days) samples of the chamber air were collected on sorbent tubes (Tenax TA) and analyzed on a thermal desorption-GC/MS system. Compounds were identified using MS-Spectra libraries, quantification was done using pure reference compound mixtures. The described method has a limit of determination of approx. 1 µg/m³. The volatile aldehydes were trapped on DNPH-coated cartridges and analyzed after elution with acetonitrile by HPLC-UV.

The measurements were performed according to the criteria of Blue Angel DE-UZ 176, DIN ISO 16000 part 3, 6, 9 and 11 and DIN EN 16516.

Evaluation: The evaluation of the emission was done according to the criteria of the Blue Angel "Low-Emission Floor Coverings, Panels and Doors for Interiors made of Wood and Wood-Based Materials (DE-UZ 176)", (January 2013), the AgBB scheme using ADAM calculation program (LCI list 2018) as well as the French regulation "ARRÊTÉ relatif à l'étiquetage des pro-duits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils" (DEVL1104875A).

Results:
Results of the chamber emission test of sample P79262 (Door)

RT	CAS-No.	Substance	Concentration in µg/m ³ after		Info
			3d	7d	
6.41	000064-19-7	Acetic acid	18	18	bd
7.46	000078-83-1	iso-Butanol	5	5	b
10.62	000110-62-3	Pentanal	2	4	bd
16.71	000066-25-1	n-Hexanal	14	9	bd
21.76	000108-94-1	Cyclohexanone	3	3	bd
22.17	000111-76-2	Butylglycol	3	3	b
23.68	000080-56-8	alpha-Pinene	3	2	bdf
24.99	000100-52-7	Benzaldehyde	1	2	bd
36.10	007473-98-5	2-Hydroxy-2-methylpropiophenone (Darocur 1173) _(Toluene)	5	5	
36.34	015206-55-0	Methyl benzoylformate (Darocur MBF) _(Toluene)	2	2	

(The fragments/substances shown in subscript were used for the quantification)

Additional information: **a** acute toxic substance cat. 1+2+3 (acc. UN-GHS/CLP); **b** German LCI list; **c** safe sampling volume too low, underestimation likely;

d odor relevant; **e** compound boiling point exceeds thermal limit of the TDS unit – underestimation likely; **f** terpene, possibly wood-related;

g chronic toxic substance CMR cat. 1A+1B (acc. UN-GHS/CLP); **h** aromatic solvent IOS-MAT-0054; **i** chlorinated solvent IOS-MAT-0054;

l specific target organ toxic substance STOT RE1+SE1 (acc. UN-GHS/CLP); **p** listed in Proposition 65; **<C6** VVOC compound; **>C16** SVOC compound.

	Concentration in µg/m ³ after	
	3d	7d
Sum of VVOC (< C6)*:	<5	<5
Sum of VOC (C6-C16) as TVOC _{original response} * ¹ :	42	37
Sum of VOC (C6-C16) as TVOC _{Toluene} according to DIN EN 16516* ² :	10	5
Sum of VOC (C6-C16) as TVOC _{Toluene} according to DIN EN ISO 16000-6* ³ :	12	7
Sum of SVOC (> C16)*:	<5	<5

*Limit value of consideration is 5 µg/m³

¹LCI-substances were quantified with the original response and non-LCI substances were quantified with toluene.

²Sum of TVOC_{original response} quantified with toluene

³Sum of all measured VOC quantified with toluene

Results of the chamber emission test of sample P79262 (Door)

CAS-No.	Substance	Concentration in $\mu\text{g}/\text{m}^3$ after		Limit of Determination [$\mu\text{g}/\text{m}^3$]
		3d	7d	
50-00-0	Formaldehyde	6	6	2
75-07-0	Acetaldehyde	6	6	3
107-02-8	Acrolein	< 1	< 1	1
123-38-6	Propanal	5	5	3
123-72-8	Butanal	< 4	< 4	4
67-64-1	Aceton	19	19	2

Parameters of the emission chamber test:

Chamber type: 1m^3 -glass chamber D

Climatic conditions: $23\text{ }^\circ\text{C}$, 50 % r.h.

Air exchange rate: 0.56 h^{-1}

Loading factor: $0.28\text{ m}^2/\text{m}^3$

Area specific air exchange rate q : $2.0\text{ m}^3/(\text{m}^2\cdot\text{h})$
 (acc. DE-UZ 176 for doors)

Test started: 04.11.2019 09:58:51

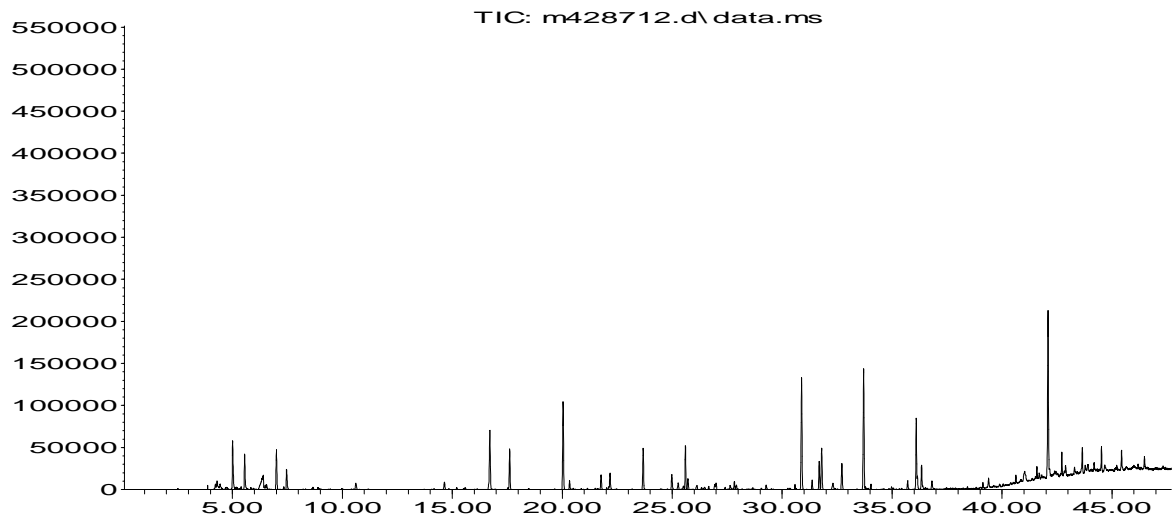
Sampling: Tenax TA, DNPH

Analysis: Thermal desorption GC/MS, HPLC/UV



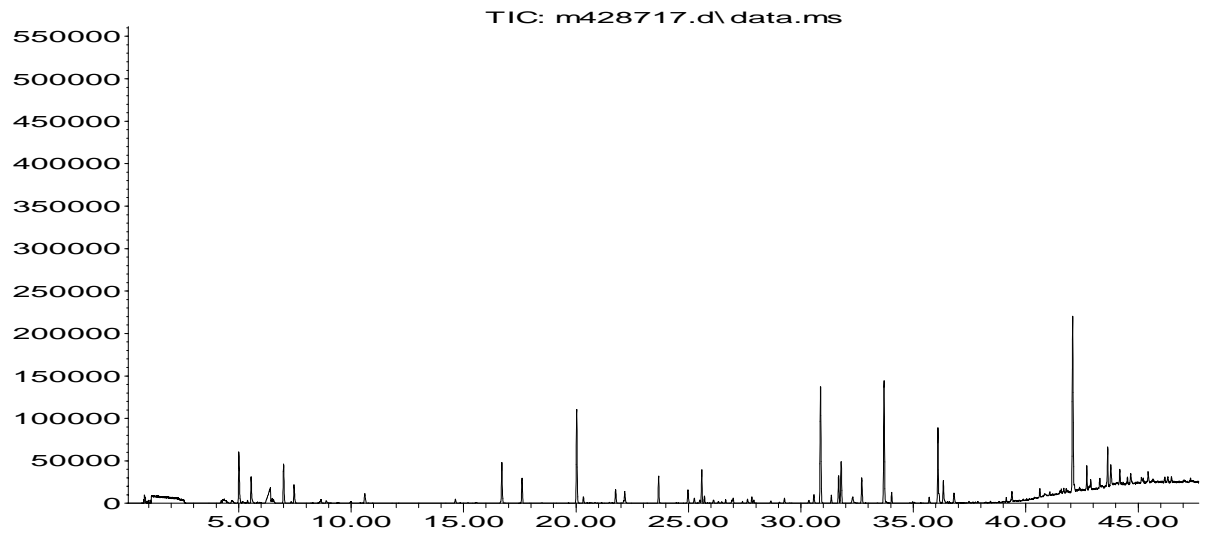
Chromatogram of the measurement after 3 days

Abundance






Chromatogram of the measurement after 7 days

Abundance



Results of the evaluation according to AgBB-scheme (LCI list 2018)

Name of the product and material ...		A28454/P79262		Client/Applicant		Berkvens Deursystemen, Someren.							
Number of the test report		MAIC-2019-4562		Testing laboratory		Fraunhofer WKI							
Parameter	Day 3					Day 7				Day 28			
	Results		Pass	Continue	Fail	Results		Pass	Continue	Results		Pass	Fail
	[$\mu\text{g}/\text{m}^3$]	[mg/m^3]	[mg/m^3]	[mg/m^3]	[mg/m^3]	[$\mu\text{g}/\text{m}^3$]	[mg/m^3]	[mg/m^3]	[mg/m^3]	[$\mu\text{g}/\text{m}^3$]	[mg/m^3]	[mg/m^3]	[mg/m^3]
TVOC	42	0.0	≤ 0.3	≤ 10.0	> 10.0	37	0.0	≤ 0.5	> 0.5			≤ 1.0	> 1.0
Σ SVOC	0	0.00	≤ 0.03	> 0.03	-	0	0.00	≤ 0.05	> 0.05			≤ 0.1	> 0.1
R-Value *	0.119	0.1	≤ 0.5	> 0.5	-	0.113	0.1	≤ 0.5	> 0.5			≤ 1	> 1
Σ VOC w/o LCI	5	0.01	≤ 0.05	> 0.05	-	5	0.01	≤ 0.05	> 0.05			≤ 0.1	> 0.1
Σ Carcinogenic	0	0.000	≤ 0.001	≤ 0.01	> 0.01	0	0.000	≤ 0.001	> 0.001			≤ 0.001	> 0.001
Total			Pass					Pass					
DIBt Parameter													
Formaldehyde	6	0.006	≤ 0.060	> 0.060	-	6	0.006	≤ 0.060	> 0.060			≤ 0.120	> 0.120
Additional Information													
Σ VVOC	36	0	-	-	-	36	0	-	-			-	-
*) dimension less  Pass  Continue  Fail													

Carcinogenic compounds would not be detected in the chamber air (limit of determination $1 \mu\text{g}/\text{m}^3$).

The emission test was performed with an area specific ventilation rate of $2.0 \text{ m}^3/(\text{m}^2 \text{ h})$, which is defined for doors (acc. Blue Angel DE-UZ 176). Using the stated loading factor and air exchange rate, the sample fulfills the requirements of the AgBB-scheme Health-related evaluation for Volatile Organic Compound Emissions from Building Products (AgBB scheme 2018, LCI list 2018) after 3 and 28 days).

Requirements fulfilled?	Evaluation after:	3 days	28 days
TVOC		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
carcinogenic compounds		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
R-value (VOC with LCI)			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
VOC without LCI			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
TSVOC			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Formaldehyde			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

**Requirements according the Blue Angel criteria
 “Low-Emission Floor Coverings, Panels and Doors for Interiors made of Wood and
 Wood-Based Materials (DE-UZ 176)”.**

DE-UZ 176

Compound or Substance	3rd Day	Final Value (28th day)
Total organic compounds within the retention range of > C ₆ -C ₁₆ (TVOC)	≤ 3 mg/m ³	≤ 0.3 mg/m ³
Total organic compound within the retention range of > C ₁₆ -C ₂₂ (TSVOC)	-	≤ 0.1 mg/m ³
Carcinogenic substances	≤ 10 µg/m ³ (total)	≤ 1 µg/m ³ (single value)
Total VOC without LCI	-	≤ 0.1 mg/m ³
R-value	-	≤ 1
Formaldehyde	-	≤ 0,05 ppm (60 µg/m ³)

Requirement fulfilled?	Evaluation after:	3rd Day	Final Value (28th day)
TVOC		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Carcinogenic substances		<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
R-value (VOC with LCI)			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
VOC without LCI			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
TSVOC			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Formaldehyde			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Remarks: The sample material fulfills the requirements of the Blue Angel DE-UZ 176 after 3 days. The “break off” criteria acc. DE-UZ 176 after 7 days were checked and could be applied.

Evaluation according to the French regulation 'ARRÊTÉ relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils' (DEVL1104875A)

Parameter	Day 7					
			A+	A	B	C
	[µg/m³]	[µg/m³]	[µg/m³]	[µg/m³]	[µg/m³]	[µg/m³]
TVOC	7	7	<1000	<1500	<2000	2000
Formaldehyde	6	6	<10	<60	<120	120
Acetaldehyde	6	6	<200	<300	<400	400
Toluene	-	-	<300	<450	<600	600
Tetrachlorethene	-	-	<250	<350	<500	500
Xylene	-	-	<200	<300	<400	400
1,2,4-Trimethylbenzene	-	-	<1000	<1500	<2000	2000
1,4-Dichlorbenzene	-	-	<60	<90	<120	120
Ethylbenzene	-	-	<750	<1000	<1500	1500
2-Butoxyethanol	3	3	<1000	<1500	<2000	2000
Styrene	-	-	<250	<350	<500	500
Total			A+			

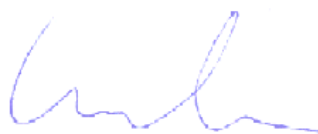
Remarks: The emission test was performed with an area specific ventilation rate of 2.0 m³/(m² h), which is defined for doors (acc. Blue Angel DE-UZ 176). Using the stated loading factor and air exchange rate, the sample fulfills the requirements for class "A+" of the French regulation "ARRÊTÉ relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils" (DEVL1104875A).

Sachbearbeiterin



N. Schulz

Für den Fachbereich



Dr. E. Uhde