eco-INSTITUT Germany GmbH

Laborprüfung
Laboratory testing

Bona Sweden AB
P.O. Box 21074
20021 Malmö
Sweden

Test Report No. B54720-001-002

This report replaces test report 54720-001-002 dated 12.12.2019

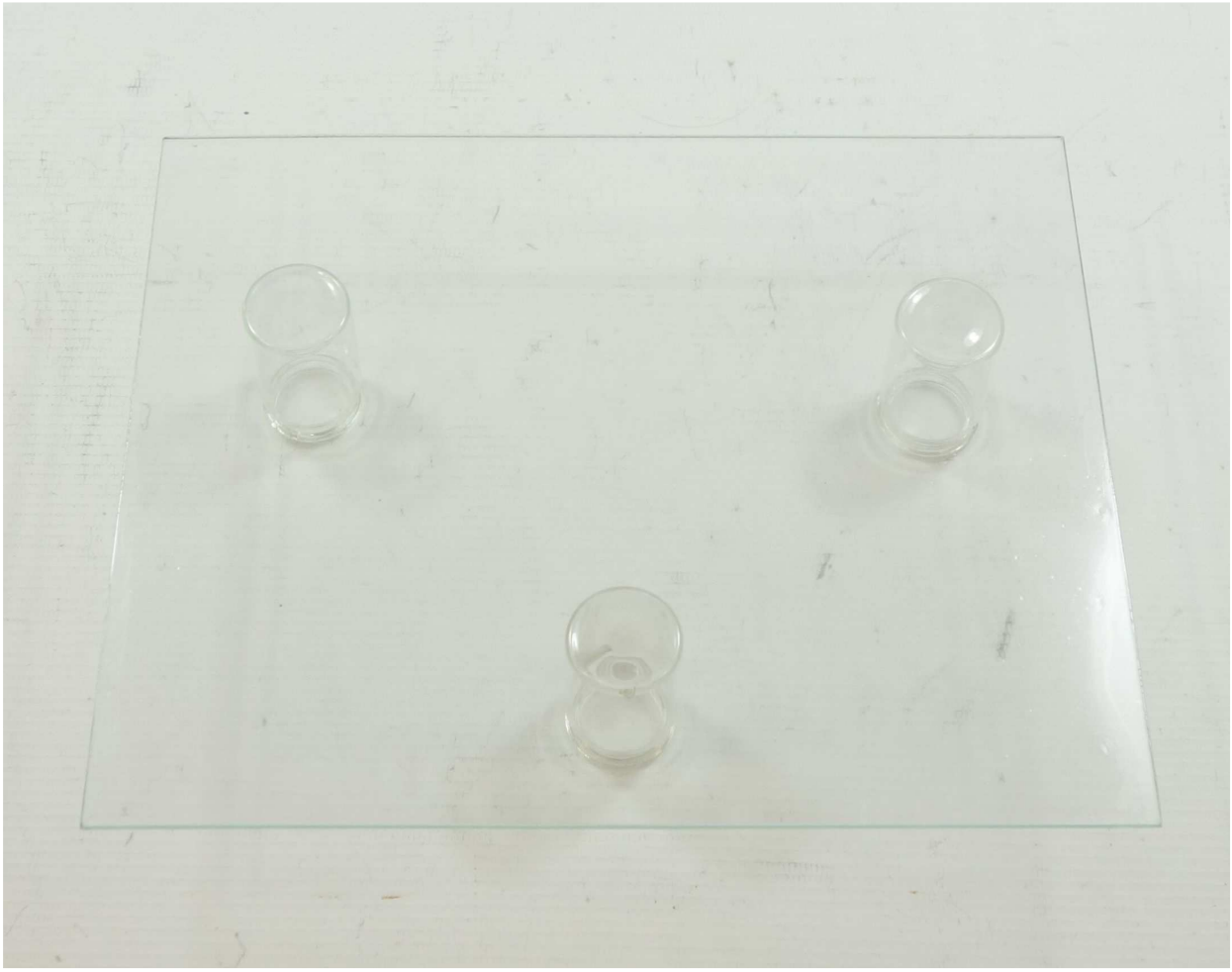
Test objective:	**Evaluation according to GEV-EMICODE Classification Criteria**
Sample description by client:	**19-032** **19-033**
Sampled by:	Not specified
Date of sampling:	14.10.2019
Location of sampling:	at the client
Date of production:	01.10.2019
Date of arrival of sample:	17.10.2019
Test period:	17.10.2019 - 11.12.2019
Date of report:	23.12.2019
Number of pages of report:	21
Testing laboratory:	eco-INSTITUT Germany GmbH, Köln except ‡ subcontracted # outside accreditation
Test objective fulfilled:	✓ Emission class EMICODE EC 1 PLUS
Note:	The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report serves exclusively for submission to the awarding authority for the above-mentioned quality mark. The report is not permitted to be used in product and company advertising. More information at www.eco-institut.de/en/advertising

Content

Sample View 3
Evaluation# 4
Summary evaluation# 5
Laboratory report 6
1 Emission analysis 6
1.1 Sample A001, Sample A002, Volatile Organic Compounds after 3 days 7
1.2 Sample A001, Sample A002, Volatile Organic Compounds after 28 days 11
Appendix 14
I Sampling sheet 14
II Definition of terms 15
III List of calibrated Volatile Organic Compounds (VOC) 18
IV Commentary on emission analysis 20
V Explanation of Specific Emission Rate SER 21

Sample View

Internal Sample-no.	Description by customer	Condition upon delivery	Type of sample
A001	19-032	without objection	Parquet finish
A002	19-033	without objection	Hardener



A001: 19-032
A002: 19-033

Evaluation#

The products **19-032** and **19-033** has been tested on behalf of **Bona Sweden AB**.

This evaluation bases on the test criteria "GEV – Surface treatment products, Award of EMICODE" (Issue: 22.05.2019) of the Association for the Control of Emissions in Products for Flooring Installation, Adhesives and Building Materials (GEV).

The results documented in the test report were evaluated as follows.[1]

Test parameter	Result		Requirement		Requirement hold [yes/no]
Emission analysis					
Measurement time: 3 days after test chamber loading					
Carcinogenic substances (acc. to EU cat. 1A and 1B and TRGS 905, sum)	< 1	µg/m³	≤ 10	µg/m³	yes
Formaldehyde	2	µg/m³	≤ 50	µg/m³	yes
Acetaldehyde	< 2	µg/m³	≤ 50	µg/m³	yes
Acetaldehyde and Formaldehyde (sum)	0.002	ppm	≤ 0.05	ppm [1)]	yes
Measurement time: 28 days after test chamber loading					
Carcinogenic substances (acc. to EU cat. 1A and 1B and TRGS 905, sum)	< 1	µg/m³	≤ 1	µg/m³	yes
Total concentration of volatile and semivolatile volatile organic compounds without acetic acid (TVOC +$TSVOC_{DIN\ EN\ 16516}$) [2) 6)]	81	µg/m³	≤ 100	µg/m³ [3)]	yes, EC 1 PLUS
Total concentration of semivolatile organic compounds ($TSVOC_{DIN\ EN\ 16516}$) [2)]	34	µg/m³	≤ 40	µg/m³ [3)]	yes, EC 1 PLUS
Sum VOC without LCI	8	µg/m³	≤ 40	µg/m³ 4)	yes
R value	1.00		≤ 1 [4)]		yes

[1)] 1 ppm Formaldehyde ≙ 1250 µg/m³ Formaldehyde; 1 ppm Acetaldehyde ≙ 1820 µg/m³ Acetaldehyde

[2)] for TVOC and TSVOC only substances ≥ 5 µg/m³ are considered

[3)] requirement value for emission class EMICODE EC 1 PLUS

[4)] additional requirement value for emission class EMICODE EC 1 PLUS

[5)] Acetic acid is not considered for the evaluation of EMICODE

[1] If a measurement result that slightly exceeds the specification is assessed as "not fulfilled", this is based on the agreement of the "shared risk of measurement uncertainty (shared risk approach)". According to this, the probability that the statement is correct is ≥ 50%. Similarly, a result slightly below the specification value also only has a probability of ≥ 50 % of being compliant. I.e., the risk of making a false negative statement regarding the fulfilment of the specification is just as high as the risk of making a false positive statement (more information at https://www.eco-institut.de/en/2019/07/measurement_uncertainty/).

Summary evaluation#

The product **19-032 19-033** meets the requirements of the **Emission Class EMICODE EC 1 PLUS**.

Cologne, 23.12.2019

Arne Herzog
(Project Manager)

Laboratory report

1 Emission analysis

Test method

DIN EN 16516:2018-01	Testing and evaluation of the release of dangerous substances; determination of emissions into indoor air

A001, A002, Preparation of test sample

Date:	05.11.2019
Pre-treatment:	Application on glassinto a glass dish with a brush mixing ratio sample A001 and A002 10:1 application quantity 150 g/m², pre-conditioning outside of the test chamber 72 hours
Masking of backside:	not applicable
Masking of edges:	no
Relationship of unmasked edges to surface:	not applicable
Loading:	related to area
Dimensions:	25 cm x 20 cm [7.5 g]

A001, A002, Test chamber conditions according to DIN ISO 16000-9:2008-04

Chamber volume:	0.125 m³
Temperature:	23°C ± 1°C
Relative humidity:	50 % ± 1 %
Air pressure:	normal
Air:	cleaned
Air change rate:	0.5 h^{-1}
Air velocity:	0.3 m/s
Loading:	0,4 m²/m³
Specific air flow rate:	1.25 m³/(m² · h)
Air sampling:	3 days after test chamber loading 28 days after test chamber loading

Analytics

Aldehydes and Ketones	DIN ISO 16000-3:2013-01
Limit of determination:	2 µg/m³
Volatile Organic Compounds	DIN ISO 16000-6:2012-11
Limit of determination:	1 µg/m³ (1,4-Cyclohexanedimethanol, Diethylene glycol, 1,4-Butanediol, Linalyl acetate: 5 µg/m³)
Note for analysis:	not specified

1.1 Sample A001, Sample A002, Volatile Organic Compounds after 3 days

Test objective:
Volatile Organic Compounds (VOC), test chamber, air sampling 3 days after test chamber loading

Test result:

Sample:	A001: 19-032 A002: 19-033

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene-equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classifi-cation++	LCI AgBB 2018 [µg/m³]	R-value
6	**Glycols, Glycol ethers, Glycol esters**							
6-1	Propylene glycol (1,2-Dihydroxypropane)	57-55-6	7.38	4			2100	0.00
6-3	Ethylene glycol-monobutylether (2-Butoxyethanol)	111-76-2	11.12	3		Group 3	1600	0.00
6-12	Dipropylene glycol monomethyl ether	34590-94-8	13.22	5			3100	0.00
6-39	Dipropylene glycol dimethyl ether	111109-77-4	13.34+13.64	2			1300	0.00
6-40	Propylene carbonate	108-32-7	13.19	530	110		1000	0.53
7	**Aldehydes**							
7-22	Formaldehyde	50-00-0		2		Carc. 1B Muta. 2	100	0.02
9	**Acids**							
9-1	Acetic acid	64-19-7	4.76	6			1200	0.01
12	**Others**							
12-10	2-Methyl-4-isothiazoline-3-one (MIT)	2682-20-4	17.24	4			100	0.04
12-11	Triethylamine	121-44-8	6.55	80	51		60	1.33

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene-equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classifi-cation++	LCI AgBB 2018 [µg/m³]	R-value
13	**Other identified substances in addition to LCI list**							
	Nitrogen compound m/z 86 58 101*		6.85-8.1	18	18			
	Pyrrolidinone		14.75	1				
	m/z 69 111 131*		22.99	53	53			
	Carboxylic acid ester m/z 129 111 55*		24.99	5	5			
	m(Z 55 84 100*		25.1	4				
	Glycol ether m/z 45 89 111*		26.44	51	51			

+ identified and calibrated substances, substance specific calculated

++ Classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B, TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A, DFG MAK-list: Categorie III1 and III2

* unidentified substances, calculated as toluene equivalent reported with significant mass fragments as mass-to-charge ratio (m/z)

Carcinogenic, mutagenic and reproductive toxic components*	Concentration after 3 days [µg/m³]	SERa [µg/(m² • h)]
CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1	< 1.25
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 1.25

TVOC, Total volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to DIN EN 16516	240	300
Sum of VOC according to AgBB 2018 / DIBt	700	870
Sum of VOC according to eco-INSTITUT-Label	710	890
Sum of VOC according to ISO 16000-6	270	340

TSVOC, Total semi volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² • h)]
Sum of SVOC according to DIN EN 16516	51	64
Sum of SVOC without LCI according to AgBB 2018 / DIBt	51	64
Sum of SVOC without LCI according to eco-INSTITUT-Label	55	69
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 6.25

TVVOC, Total very volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	< 5	< 6.25
Sum of VVOC according to eco-INSTITUT-Label	2	2.5

*Excluding formaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). In the case of a toxicological emission assessment, a single-substance analysis of the formaldehyde concentration is necessary.
In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

Other sums of VOC	Concentration after 3 days [µg/m³]	SERa [µg/(m² • h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	76	95
VOC without LCI according to eco-INSTITUT-Label (Sum)	77	96
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	2	2.5
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	6	7.5
Bicyclic Terpenes (sum)	< 1	< 1.25
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 1.25
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	< 2	< 2.5
C9 - C15 Alkylated benzenes (Sum)	< 1	< 1.25
Cresols (Sum)	< 1	< 1.25

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	1.94
R-value according to AgBB 2018 / DIBt	1.87
R-value according to Belgian regulation	1.87
R-value according to AFSSET	11.45

Note:

Due to different requirements in the respective guidelines, the calculation of TVOC, TVVOC, TSVOC and R-value may result in different values.

Short-chain carbonyl compounds (C1-C5) are quantified via HPLC acc. to DIN ISO 16000-3:2013-01. Therefore, no toluene equivalents are given for VVOC. These substances are taken into concern by means of their substance specific calibration via the sum of VVOC acc. to DIN EN 16516:2018-01. For VOC however, the substance specific calibration takes place via HPLC whereas the TVOC is calculated using the toluene equivalent determined via Tenax acc. to DIN EN 16516:2018-01.

1.2 Sample A001, Sample A002, Volatile Organic Compounds after 28 days

Test objective:
Volatile Organic Compounds (VOC), test chamber, air sampling 28 days after test chamber loading

Test result:

Sample:	A001: 19-032 A002: 19-033

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene-equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classifi-cation++	LCI AgBB 2018 [µg/m³]	R-value
6	**Glycols, Glycol ethers, Glycol esters**							
6-40	Propylene carbonate	108-32-7	12.88	2			1000	0.00
9	**Acids**							
9-1	Acetic acid	64-19-7	4.73	2			1200	0.00
12	**Others**							
12-11	Triethylamine	121-44-8	6.53	60	39		60	1.00
13	**Other identified substances in addition to LCI list**							
	m/z 69 111 131*		22.99	8	8			
	Carboxylic acid ester m/z 129 111 55*		24.99	2				
	m/z 55 84 100*		25.1	1				
	Glycol ether m/z 45 89 111*		26.44	34	34			

+ identified and calibrated substances, substance specific calculated

++ Classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B, TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A, DFG MAK-list: Categorie III1 and III2

* unidentified substances, calculated as toluene equivalent reported with significant mass fragments as mass-to-charge ratio (m/z)

Carcinogenic, mutagenic and reproductive toxic components*	Concentration after 28 days [µg/m³]	SERa [µg/(m² • h)]
CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1	< 1,25
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 1,25

TVOC, Total volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to DIN EN 16516	47	59
Sum of VOC according to AgBB 2018 / DIBt	68	85
Sum of VOC according to eco-INSTITUT-Label	74	93
Sum of VOC according to ISO 16000-6	60	75

TSVOC, Total semi volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² • h)]
Sum of SVOC according to DIN EN 16516	34	43
Sum of SVOC without LCI according to AgBB 2018 / DIBt	34	43
Sum of SVOC without LCI according to eco-INSTITUT-Label	35	44
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 6,25

TVVOC, Total very volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	< 5	< 6,25
Sum of VVOC according to eco-INSTITUT-Label	< 1	< 1,25

*Excluding formaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). In the case of a toxicological emission assessment, a single-substance analysis of the formaldehyde concentration is necessary.
In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

Other sums of VOC	Concentration after 28 days [µg/m³]	SERa [µg/(m² • h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	8	10
VOC without LCI according to eco-INSTITUT-Label (Sum)	10	13
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	< 1	< 1,25
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	< 1	< 1,25
Bicyclic Terpenes (Sum)	< 1	< 1,25
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 1,25
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	< 2	< 2,5
C9 - C15 Alkylated benzenes (Sum)	< 1	< 1,25
Cresols (Sum)	< 1	< 1,25

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	1.00
R-value according to AgBB 2018 / DIBt	1.00
R-value according to Belgian regulation	1.00
R-value according to AFSSET	8.57

Note:
Due to different requirements in the respective guidelines, the calculation of TVOC, TVVOC, TSVOC and R-value may result in different values.
Short-chain carbonyl compounds (C1-C5) are quantified via HPLC acc. to DIN ISO 16000-3:2013-01. Therefore, no toluene equivalents are given for VVOC. These substances are taken into concern by means of their substance specific calibration via the sum of VVOC acc. to DIN EN 16516:2018-01. For VOC however, the substance specific calibration takes place via HPLC whereas the TVOC is calculated using the toluene equivalent determined via Tenax acc. to DIN EN 16516:2018-01.

Cologne, 23.12.2019

M. Stein

Michael Stein, Dipl.-Chem.
(Laboratory Manager)

Appendix

I Sampling sheet

eco-INSTITUT Germany GmbH

eco-INSTITUT-Label
Sampling Sheet*

eco INSTITUT TESTED PRODUCT ID 0808 - 47110 - 001

Project number eco-INSTITUT / will be filled in by Laboratory: **54720-001-002**

Testing laboratory	eco-INSTITUT Germany GmbH Schanzenstr. 6-20, D-51063 Cologne Tel. +49 (0)221 - 931245-0 Fax +49 (0)221 - 931245-33	**Sampler** (Name, Company, Phone)	
Name of manufacturer / distributor at place of sampling (Address / Stamp)	Bona Sweden AB Murmansgatan 130 200 21 Malmö Sweden	**Customer/ Invoice recipient** (if different from manufacturer)	Bona Sweden AB Erik Fosstveit erik.fosstveit@bona.com
Product name	19-032 19-033	**Product type** (e.g. parquet, floor covering)	parquet finish
Model / programme / series		**Batch**	1940-0094
Article number		**Production date of batch**	2019-10-01
Samples are taken from	☒ current production ☐ storage	**Sampling date**	2019-10-14
		Sampling time	
Storage location before sampling	☒ production ☐ storage ☐ other:	**Storage conditions before sampling**	☐ open ☒ packaged
	Storage location:		Packaging material:

Special features (possible negative effects through emissions at place of sampling (e.g. benzine, exhaust fumes), unclarities, questions etc.)

Validation

Hereby the signer affirms the accuracy of the above-mentioned statements. The sample was chosen, sampled and packaged according to the sampling guidelines.

Date: 20191213 Signature: (Stamp)

* Please take one sampling sheet for each sample! The sampling instruction must be strictly maintained.

Order

(Please insert quote number, or - if not available, please enter the desired analysis)

eco-INSTITUT Germany GmbH / Schanzenstrasse 6-20 / Carlswerk 1 19 / D-51063 Köln / Germany
Tel. +49 221.931245-0 / Fax +49 221.931245-33 / eco-institut.de / Geschäftsführer: Dr. Frank Kuebart, Daniel Tigges
HRB 17917 / USt-ID: DE 122653308 / Raiffeisenbank Frechen-Hürth, IBAN: DE60370623651701900010, BIC: GENODED1FHH

Nach DIN EN ISO/IEC 17025 akkreditiertes Prüflabor
DAkkS Deutsche Akkreditierungsstelle D-PL-20051-01-00

II Definition of terms

VOC (volatile organic compounds)	All individual compounds with a concentration ≥ 1 µg/m³ in the retention range C_6 (n-Hexane) to C_{16} (n-Hexadecane)
TVOC	Total volatile organic compounds
TVOC according to DIN EN 16516:2018-01	Sum of all VOC ≥ 5 µg/m³ in the retention range C_6 to C_{16}, calculated as toluene equivalent
TVOC according to AgBB/DIBt	Sum of all identified and calibrated VOC ≥ 5 µg/m³, SVOC ≥ 5 µg/m³ with LCI and not calibrated VOC ≥ 5 µg/m³ calculated as toluene equivalent
TVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VOC ≥ 1 µg/m³, SVOC ≥ 5 µg/m³ with LCI and not calibrated VOC ≥ 1 µg/m³ calculated as toluene equivalent
TVOC according to ISO 16000-6:2012-11	Total area of chromatogram in the retention range C_6 to C_{16}, calculated as toluene equivalent
TVOC without LCI according to AgBB/DIBt and Belgian regulation	Sum of all VOC without NIK ≥ 5 µg/m³ in the retention range C_6 to C_{16}
TVOC without LCI according to eco-INSTITUT-Label	Sum of all VOC without NIK ≥ 1 µg/m³ in the retention range C_6 to C_{16}
CMR-VOC (carcinogenic, mutagenic, reproduction-toxic VOC, VVOC and SVOC)	All individual substances with the following categories: Regulation (EC) No. 1272/2008: Category Car.1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B IARC: Group 1 and 2A DFG (MAK lists): Category III1and III2
VVOC (very volatile organic compounds)	All individual substances with a concentration ≥ 1 µg/m³ in the retention range < C_6
TVVOC	Total very volatile organic compounds
TVVOC according to AgBB/DIBt and Belgian regulation	Sum of all identified and calibrated VVOC ≥ 5 µg/m³ with LCI
TVVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VVOC ≥ 1 µg/m³ with LCI
SVOC (semi volatile organic compounds)	All individual substances ≥ 1 µg/m³ in the retention range C_{16} to C_{22}
TSVOC	Total semi volatile organic compounds
TSVOC according to DIN EN 16516:2018-01	Sum of all SVOC in the retention range C_{16} to C_{22}, calculated as toluene equivalent
TSVOC without LCI according to AgBB/DIBt	Sum of all SVOC ≥ 5 µg/m³ without LCI
TSVOC without LCI according to eco-INSTITUT-Label	Sum of all SVOC ≥ 1 µg/m³ without LCI
TSVOC with LCI according to AgBB/DIBt	Sum of all identified and calibrated SVOC ≥ 5 µg/m³ with LCI
SER	Specific emission rate (see appendix IV)

LCI value	Lowest Concentration of Interest; calculated value for the evaluation of VOC, established by the Committee for Health-related Evaluation of Building Products (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten - AgBB)
R value	The quotient of the concentration and the LCI value is generated for every substance which is detected in the test chamber air. The sum of the calculated quotients results in the R value.
R value according to eco-INSTITUT-Label	R value for all identified and calibrated VOC $\geq$ 1 µg/m³ with LCI, established by the AgBB in 2018
R value according to AgBB 2018/DIBt	R value for all identified and calibrated VOC $\geq$ 5 µg/m³ with LCI, established by the AgBB in 2018
R value according to Belgian regulation	R value for all identified and calibrated VOC $\geq$ 5 µg/m³ with LCI, established by the Belgian regulation
R value according to AFSSET	R value for all identified and calibrated VOC $\geq$ 5 µg/m³ with LCI, established by ANSES (French National Agency on Food Safety, Environment, and Workplace Security)
RT (retention time)	Time for a particular analyte to pass through the system (from the column inlet to the detector)
CAS No. (Chemical Abstracts Service)	International unique numerical identifier for a chemical substance
Toluene equivalent	Concentration, calculated as toluene equivalent

III List of calibrated Volatile Organic Compounds (VOC)

Aromatic hydrocarbons
Toluene
Ethylbenzene
p-Xylene
m-Xylene
o-Xylene
Isopropylbenzene
n-Propylbenzene
1,3,5-Trimethylbenzene
1,2,4-Trimethylbenzene
1,2,3-Trimethylbenzene
2-Ethyltoluene
1-Isopropyl-2-methylbenzene
1-Isopropyl-4-methylbenzene
1,2,4,5-Tetramethylbenzene
n-Butylbenzene
1,3-Diisopropylbenzene
1,4-Diisopropylbenzene
Phenyloctane
1-Phenyldecane[2]
1-Phenylundecane[2]
4-Phenylcyclohexene
Styrene
ß-Methylstyrene
Phenylacetylene
2-Phenylpropene
Vinyltoluene
Naphthalene
Indene
Benzene
1-Methylnaphthalene
2-Methylnaphthalene
1,4-Dimethylnaphthalene

Saturated aliphatic substances
2-Methylpentane[1]
3-Methylpentane[1]
n-Hexane
Cyclohexane
Methylcyclohexane
n-Heptane
n-Octane
n-Nonane
n-Decane
n-Undecane
n-Dodecane
n-Tridecane
n-Tetradecane
n-Pentadecane
n-Hexadecane
Methylcyclopentane
1,4-Dimethylcyclohexane
2,2,4,6,6-Pentamethylheptane

Terpenes
δ-3-Caren
α-Pinene
β-Pinene
β-Caryophyllene
α-Phellandrene
Myrcene
Camphene
α-Terpinene
Longipinene
trans-β-Farnesene
cis-β-Farnesene
Isolongifolene

Aliphatic alcohols and ether
1-Propanol[1]
2-Propanol[1]
1-Butanol
1-Pentanol
1-Hexanol
tert-Butanol
Cyclohexanol
2-Ethyl-1-hexanol
2-Methyl-1-propanol
1-Octanol
4-Hydroxy-4-methyl-2-pentanone
1-Heptanol
1-Nonanol
1-Decanol
1,4-Cyclohexandimethanol

Aromatic alcohols (phenoles)
Phenol
BHT (2,6-Di-tert-butyl-4-methylphenol)
Benzyl alcohol
Cresols

Glycols, Glycol ether, Glycol ester
Propylenglycol (1,2-Dihydroxypropane)
Ethyleneglycol (Ethandiol)
Ethylene glycol monobutyl ether
Diethylene glycol
Diethylene glycol-monobutyl ether
2-Phenoxyethanol
Ethylene carbonate
1-Methoxy-2-propanol
2-Methoxy-1-propanol
2-Methoxy-1-propyl acetate
Texanol
Glycolic acid butylester
Butyl diglycol acetate
Dipropylene glycol monomethyl ether
2-Methoxyethanol
2-Ethoxyethanol
2-Propoxyethanol
2-Methylethoxyethanol
2-Hexoxyethanol
1,2-Dimethoxyethane
1,2-Diethoxyethane
2-Methoxyethyl acetate
2-Ethoxyethyl acetate
2-(2-Hexoxyethoxy)ethanol
1-Methoxy-2-(2-methoxy-ethoxy)ethane
Dipropylene glycol monomethylether acetate
Dipropylene glycol n- butylether
Dipropylene glycol n-propyl ether
Di(propylene glycol) tert-butylether
1,4-Butanediol
Tri(propylene glycol) methyl ether
Triethylene glycol dimethyl ether
Propylene glycol dimethyl ether
TXIB (Texanol isobutyrate)
Ethyldiglycol
Dipropylene glycol dimentylether
Propylene carbonate
Hexyleneglycol
3-Methoxy-1-butanol
Propylene glycol n-propyl ether
Propylene glycol n-butyl ether
Diethylene glycol phenyl ether
Neopentyl glycol
Diethylene glycol methyl ether
1-Ethoxy-2-propanol
tert-Butoxy-2-propanol
2-Butoxy ethyl acetate

Aldehydes
Butanal[1,3]
3-Methyl-1-butanal
Pentanal[3]
Hexanal
Heptanal
2-Ethylhexanal
Octanal
Nonanal
Decanal
2-Butenal[3]
2-Pentenal[3]
2-Hexenal
2-Heptenal
2-Octenal
2-Nonenal
2-Decenal
2-Undecenal
Furfural
Ethanedial (Glyoxal)[1,3]
Glutaraldehyde
Benzaldehyde
Acetaldehyde[1,3]
Formaldehyde[1,3]
Propanal[1,3]
Propenal[1,3]
Isobutenal[3]

Ketones
Ethylmethylketone[3]
3-Methyl-2-butanone
Methylisobutylketone
Cyclopentanone
Cyclohexanone
Acetone[1,3]

Limonene
Longifolene

1-Hydroxyacetone
2-Heptanon

Acids
Acetic acid
Propionic acid
Isobutyric acid
Butyric acid
Pivalic acid
Valeric acid
Caproic acid
Heptanoic acid
Octanoic acid
2-Ethylhexanoic acid

Esters and Lactones
Methylacetate[1]
Ethyl acetate[1]
Vinyl acetate[1]
Isopropyl acetate
Propyl acetate
2-Methoxy-1-methylethyl acetate
n-Butyl formate
Methylmethacrylate
Isobutylacetate
1-Butyl acetate
2-Ethylhexyl acetate
Methyl acrylate
Ethyl acrylate
n-Butyl acrylate
2-Ethylhexyl acrylate
Adipic acid dimethylester
Fumaric acid dibutylester
Succinic acid dimethylester
Propylene glycol diacetate
Dipropylene glycol

Glutaric acid dimethylester
Hexandioldiacrylate
Maleic acid dibutylester
Butyrolactone
Glutaric acid diisobutylester
Succinic acid diisobutylester
Dimethylphthalate
Diethylphthalate[2]
Dipropylphthalate[2]
Dibutylphthalate[2]
Diisobutylphthalate[2]
Dipropyleneglycoldiacrylate

Chlorinated hydrocarbons
Tetrachlorethene
1,1,1-Trichlorethane
Trichlorethene
1,4-Dichlorbenzene
Chlorobenzene
2-chloro-propane

Others
1,4-Dioxane
Caprolactam
N-Methyl-2-pyrrolidone
Octamethylcyclotetrasiloxane
Hexamethylcyclotrisiloxane
Methenamine
2-Butanonoxime
Triethyl phosphate
Tributyl phosphate
5-Chlor-2-methyl-4-isothiazolin-3-one (CIT)
2-Methyl-4-isothiazolin-3-one (MIT)
Triethylamine
2-Methylcyclopentanone
2-Methylcyclohexanone
Acetophenone

Decamethylcyclopentasiloxane
Dodecamethylcyclohexasiloxane
Tetrahydrofuran (THF)
1-Decene
Benzothiazole
1-Octene
2-Pentylfurane
2-Methylfurane
Isophorone
Tetramethyl succinonitrile
Dimethylformamide (DMF)
Tributyl phosphate
N-Ethyl-2-pyrrolidone
Aniline
4-Vinylcyclohexene
Dichlormethane
Carbon tetrachloride
Chloroform
Chloroprene (monomer)
Acetamide
Formamide
1,3-Dichlor-2-propanol
2-n-Octyl-4-isothiazolin-3-one (OIT)
Cyclohexylisocyanate
Butyl methacrylate
2-Hexanone
Azobis[isobutyronitrile]

1 VVOC
2 SVOC
3 Analysis according to DIN ISO 16000-3:2013-01

IV Commentary on emission analysis

Test method

Measurement of the volatile organic compounds takes place in the test chamber in conditions similar to those applying in practice. Standardized test conditions are defined for the test chamber regarding loading, air exchange, relative humidity, temperature and incoming air, based on the type of test specimen and the required guideline. These conditions and the underlying standards are to be found in the section on test methods in the laboratory report.

Air samples are taken from the test chamber at defined points in time during the continuously running test. To this end, approximately 5 L of air are collected from the test chamber with an air flow rate of 100 mL/min for Tenax and approx. 100 L with an air flow rate of 0.8 L/min for DNPH (dinitrophenylhydrazine).

After thermal desorption, the substances adsorbed on Tenax are analysed using gas chromatographic separation and mass spectrometric determination. The gas chromatographic separation is performed with a slightly polar capillary column of 60 m in length.

The substances derivatized with DNPH for the determination of formaldehyde and other short-chain carbonyl compounds (C1 - C6) are analysed using high-performance liquid chromatography.

Over 200 compounds, including volatile organic compounds (C6 - C16), semi-volatile organic compounds (C16 - C22) and – insofar as possible with this method – also very volatile organic compounds (less than C6) are determined and quantified individually.

All other substances – insofar as is possible – are identified through comparison with a library of spectra. The quantification of these substances and non-identified substances is performed through a comparison of their signal area with the signal of the internal standard d8 toluene. As far as possible, identification and quantification limit of any substance shall be 1 µg per m^3 for substances adsorbed on Tenax and 2 µg/m^3 for DNPH-derivatized substances (limit of quantification).

Quality assurance

The eco-INSTITUT Germany GmbH is granted flexible scope of accreditation pursuant to DIN EN ISO/IEC 17025:2018-03. The accreditation covers the analytical determination of all volatile organic compounds, including the test chamber method.

In each analysis the analytical system is checked using an external standard based on the specifications in standard DIN EN 16516:2018-01. The stability of the analytical systems is documented based on the test standard using control charts.

Laboratory performance is assessed at least once a year in inter-laboratory comparisons by comparing the results with those obtained by other laboratories for identical samples.

A blank is run prior to introducing the test specimen into the test chamber to check for the possible presence of volatile organic compounds.

The expanded measurement uncertainty U for the analytical determination of all volatile organic compounds, including the test chamber method is estimated to 37 %. The calculation is based on DIN ISO 11352:2013-03 (Nordtest).

V Explanation of Specific Emission Rate SER

Emission measurements are accomplished in test chambers under defined physical conditions (temperature, relative humidity, room loading, air change rate etc.).

Test chamber measurement results are directly comparable only if the investigations were accomplished under the same basic conditions.

If the differences of the physical conditions refer only to the change of air rate and/or the loading, the "SER" or "specific emission rate" can be used for comparability of the measurement results. The SER indicates how many volatile organic compounds (VOC) are released by the sample for each material unit and hour (h).

The SER can be calculated using the formula below for each proven individual component of the VOC from the data in the test report.

As material units the following are applicable:

l = unit of length (m)	relation between emission and length
a = unit area (m^2)	relation between emission and surface
v = unit volume (m^3)	relation between emission and volume
u = piece unit (unit = piece)	relation between emission and complete unit

From this the different dimensions for SER result:

length-specific	SER_l	in µg/(m·h)
surface-specific	SER_a	in µg/(m^2·h)
volume-specific	SER_v	in µg/(m^3·h)
unit specific	SER_u	in µg/(u·h)

SER thus represents a product specific rate, which describes the mass of the volatile organic compound, which is emitted by the product per time unit at a certain time after beginning of the examination.

$$SER = q \cdot c$$

q specific air flow rate (quotient from change of air rate and loading)

c concentration of the measured substance(s)

The result can be indicated in milligrams (mg) in place of micro grams (µg), whereby 1 mg = 1000 µg.