

CHRISTIAN BERNER AB  
Box. 88  
SE-435 22 Mölnlycke

## Test Report No. 55865-001-AgBB-L II

Test objective:	Evaluation according to AgBB-scheme 2018
Name of test sample/item by client:	Purestep
Sample/batch by client:	61598
Sampled by:	Rückmann, Christoph
Date of sampling:	23.11.2020
Location of sampling:	Salzwedel
Date of production:	22.11.2020
Date of arrival of sample:	25.11.2020
Test period:	25.11.2020 - 06.01.2021
Date of report:	14.01.2021
Number of pages of report:	23
Testing laboratory:	eco-INSTITUT Germany GmbH, Köln except ‡ subcontracted # outside accreditation
Test objective fulfilled:	✓

Note:

The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report is not permitted to be used in product and company advertising. The report may be published in full as technical documentation on the Internet with the written consent of eco-INSTITUT Germany GmbH. eco-INSTITUT Germany GmbH has recommended that the manufacturer repeats the test after 3 years at the latest. More information at [www.eco-institut.de/en/advertising](http://www.eco-institut.de/en/advertising)

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## Sample View

Internal sample-no. (will be filled in by laboratory)	Test sample/item by client	Sample/batch by client	Condition upon delivery	Type of sample
55865-A001	Purestep	61598	without objection	Underlay



55865-A001

## Statement of conformity with AgBB 2018 criteria

The sample with the internal sample no. 55865-A001 has been tested on behalf of **CHRISTIAN BERNER AB**. The article description according to the customer is **Purestep**.

This evaluation is based on the test criteria of the Scheme "Health-related Evaluation of Emissions of Volatile Organic Compounds (VVOC, VOC and SVOC) from Building Products" of the Committee for Health-Related Evaluation of Building Products (AgBB 2018).

The results documented in the test report were evaluated as follows.<sup>1</sup>

Test parameter	Result	Requirement	Requirement hold [yes/no]
<b>Emission analysis</b>			
<b>Measurement time: 3 days after test chamber loading</b>			
Sum VOC (C6-C16) including SVOC with LCI <sup>1)</sup>	1.5 mg/m <sup>3</sup>	≤ 10 mg/m <sup>3</sup>	yes
Sum carcinogenic substances (EU cat. 1A and 1B)	< 0.001 mg/m <sup>3</sup>	≤ 0.01 mg/m <sup>3</sup>	yes
<b>Measurement time: 28 days after test chamber loading</b>			
Sum VOC (C6-C16) including SVOC with LCI <sup>1)</sup>	0.22 mg/m <sup>3</sup>	≤ 1 mg/m <sup>3</sup>	yes
Sum SVOC without LCI (C <sub>16</sub> -C <sub>22</sub> ) <sup>1)</sup>	< 0.005 mg/m <sup>3</sup>	≤ 0.1 mg/m <sup>3</sup>	yes
R-Wert (dimensionless)	0.11	≤ 1	yes
Sum VOC without LCI	0.057 mg/m <sup>3</sup>	≤ 0.1 mg/m <sup>3</sup>	yes
Sum carcinogenic substances (EU cat. 1A and 1B)	< 0.001 mg/m <sup>3</sup>	≤ 0.001 mg/m <sup>3</sup>	yes

1) for Sum VOC (C6-C16) and Sum SVOC (C16-C22) only substances ≥ 5 µg/m<sup>3</sup> are considered

2) Requirement hold due to the rounding specifications to one significant digit

<sup>1</sup> 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/](https://www.eco-institut.de/en/2019/07/measurement_uncertainty/)).

## Summary statement of conformity with AgBB 2018

The sample with the internal sample no. 55865-A001, article description according to customer: **Purestep**, meets the emission requirements of the AgBB-Scheme.

Cologne, 14.01.2021

A handwritten signature in black ink, reading "M. -A. Dobaj", with a long, sweeping flourish extending from the end.

Marc-Anton Dobaj, M.Sc. Crystalline Materials  
(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, Preparation of test sample

Date:

07.12.2020

Sample preparation:

not applicable ;

Masking of backside:

yes

Masking of edges:

no

Relationship of unmasked  
edges to surface:

not applicable

Loading:

related to area

Dimensions:

25 cm x 20 cm [Thickness: 6mm]

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

Chamber volume:

0.125 m<sup>3</sup>

Temperature:

23°C ± 1°C

Relative humidity:

50 % ± 1 %

Air pressure:

normal

Air:

cleaned

Air change rate:

0.5 h<sup>-1</sup>

Air velocity:

0.3 m/s

Loading:

0.4 m<sup>3</sup>/m<sup>3</sup>

Specific air flow rate:

1.25 m<sup>3</sup>/(m<sup>2</sup> · 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/m<sup>3</sup>

Volatile Organic Compounds

DIN ISO 16000-6:2012-11

Limit of determination:

1 µg/m<sup>3</sup> (1,4-Cyclohexanedimethanol, Diethylene glycol,  
1,4-Butanediol: 5 µg/m<sup>3</sup>)

Note for analysis:

not specified

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

### Test objective:

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

### Test result:

Internal sample number: 55865-A001

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
<b>1</b>	<b>Aromatic hydrocarbons</b>							
1-1	Toluene	108-88-3	8.2	13	13	Repr. 2	2900	0.00
1-11	1.2.4-Trimethylbenzene	95-63-6	13.32	3			450	0.01
1-19	1.3-Diisopropylbenzene	99-62-7	16.5	7	8		750	0.01
1-20	1.4-Diisopropylbenzene	100-18-5	17.05	5	6		750	0.01
<b>2</b>	<b>Aliphatic hydrocarbons (n-, iso- and cyclo-)</b>							
2-10.1	n-Nonane	111-84-2	10.19	2			6000	0.00
2-10.2	n-Decane	124-18-5	13.11	11	15		6000	0.00
2-10.3	n-Undecane	1120-21-4	15.22	10	14		6000	0.00
2-10.4	n-Dodecane	112-40-3	17.32	3			6000	0.00
2-10.7	n-Pentadecane	629-62-9	23.65	1			6000	0.00
<b>4</b>	<b>Aliphatic mono alcohols (n-, iso-, cyclo-) and dialcohols</b>							
4-6	1-Butanol	71-36-3	5.99	11	9		3000	0.00
4-10	2-Ethyl-1-hexanol	104-76-7	13.74	13	11		300	0.04
<b>5</b>	<b>Aromatic alcohols</b>							
5-2	BHT (2,6-di-tert-butyl-4- methylphenol)	128-37-0	23.99	3		Group 3	100	0.03
<b>6</b>	<b>Glycols, Glycol ethers, Glycol esters</b>							
6-1	Propylene glycol (1,2- Dihydroxypropane)	57-55-6	7.26	1			2100	0.00
6-3	Ethylene glycol-monobutylether (2-Butoxyethanol)	111-76-2	11.02	20	16	Group 3	1600	0.01

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
<b>7</b>	<b>Aldehyde</b>							
7-20	Acetaldehyde	75-07-0		11		Carc. 2	1200	0.01
7-21	Propanal	123-38-6		9			750	0.01
<b>8</b>	<b>Ketones</b>							
8-5	Cyclohexanone	108-94-1	11.08	8	7	III3B	410	0.02
8-10	Acetone	67-64-1		30			1200	0.03
<b>9</b>	<b>Acids</b>							
9-1	Acetic acid	64-19-7	5.03	130	56		1200	0.11
9-2	Propionic acid	79-09-4	6.09	1			1500	0.00
<b>10</b>	<b>Esters</b>							
10-6	2-Methoxy-1-methylethyl acetate	108-65-6	9.91	2			2700	0.00
10-11	1 Butyl acetate	123-86-4	8.85	2			4800	0.00
10-12	2-Ethylhexyl acetate	103-09-3	16.15	5	7		350	0.01
<b>12</b>	<b>Others</b>							
12-4	Octamethylcyclotetra-siloxane (D4)	556-67-2	12.26	41	23	Repr. 2	1200	0.03
12-12	Decamethylcyclopentasiloxane (D5)	541-02-6	15.56	54	38		1500	0.04
12-13	Dodecamethylcyclohexasiloxane (D6)	540-97-6	19.2	38	26		1200	0.03
12-16	Tetradecamethylcycloheptasiloxane (D7)	107-50-6	22.8	12	11		1200	0.01
<b>13</b>	<b>Other identified substances in addition to LCI list</b>							
	Benzothiazole	95-16-9	18.81	1				
2-10	2,2,4,6,6-Pentamethylheptane	13475-82-6	13.11	21	28		6000	0.00
	Hexamethylcyclotrisiloxane (D3)	541-05-9	8.71	17	10			
	Acetamide	60-35-5	7.6	3		Carc. 2		
	Formamide	75-12-7	6.33	6		Repr. 1B		
	Multiple superimposed VVOC*		4.16	24	24			



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
	m/z 79*		4.42	7	7			
	Dimethyl sulfoxide*		9.34	2				
	m/z 41 59*		10.79	3				
	Butyl propionate*		10.96	12	12			
2-10	Other saturated aliphatic hydrocarbons C9 to C10*	--	12.32	3			6000	0.00
2-10	Cluster Isoalkanes C10 to C13*	--	13.2-18.5	940	940		6000	0.16
	m/z 57 73		18.93	85	85			
	Isopropyl acetophenone*		20.54	5	5			
	Isopropyl acetophenone*		21.31	2				
	Aromatic compound m/z 115 145 160*		21.65	2				
	Diacetyl benzene*		22.95	13	13			
	Diacetyl benzene*		23.3	3				
	m/z 43 177*		23.45	2				
	m/z 43 121 163*		23.6	4				
	m/z 43 163*		24.24	1				
	Siloxane, SVOC*		25.19	3				

+ 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: Kategorie 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)	6	7.5
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	1400	1700
Sum of VOC according to AgBB 2018 / DIBt	1500	1800
Sum of VOC according to eco-INSTITUT-Label	1500	1900
Sum of VOC according to ISO 16000-6	1500	1900

TSVOC, Total semi volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
Sum of SVOC according to DIN EN 16516	< 5	< 6.25
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 6.25
Sum of SVOC without LCI according to eco-INSTITUT-Label	3	3.8
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	81	100
Sum of VVOC according to eco-INSTITUT-Label	81	100

\*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)	140	170
VOC without LCI according to eco-INSTITUT-Label (Sum)	160	200
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)	76	95
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)	650	810
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	9	11
C9 - C15 Alkylated benzenes (Sum)	15	19
Cresols (Sum)	< 1	< 1.25

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.58
R-value according to AgBB 2018 / DIBt	0.54
R-value according to Belgian regulation	0.54
R-value according to AFSSET	2.06

**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, Volatile Organic Compounds after 28 days

### Test objective:

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

### Test result:

Internal sample number: 55865-A001

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
<b>1</b>	<b>Aromatic hydrocarbons</b>							
1-19	1,3-Diisopropylbenzene	99-62-7	16.46	1			750	0.00
1-20	1,4-Diisopropylbenzene	100-18-5	17.01	1			750	0.00
<b>2</b>	<b>Aliphatic hydrocarbons (n-, iso- and cyclo-)</b>							
2-10.7	n-Pentadecane	629-62-9	23.62	1			6000	0.00
<b>4</b>	<b>Aliphatic mono alcohols (n-, iso-, cyclo-) and dialcohols</b>							
4-6	1-Butanol	71-36-3	5.97	4			3000	0.00
4-10	2-Ethyl-1-hexanol	104-76-7	13.69	4			300	0.01
<b>5</b>	<b>Aromatic alcohols</b>							
5-2	BHT (2,6-di-tert-butyl-4- methylphenol)	128-37-0	23.96	3		Group 3	100	0.03
<b>6</b>	<b>Glycols, Glycol ethers, Glycol esters</b>							
6-3	Ethylene glycol-monobutylether (2-Butoxyethanol)	111-76-2	10.97	3		Group 3	1600	0.00
<b>7</b>	<b>Aldehyde</b>							
7-20	Acetaldehyde	75-07-0		4		Carc. 2	1200	0.00
7-21	Propanal	123-38-6		3			750	0.00
<b>8</b>	<b>Ketones</b>							
8-5	Cyclohexanone	108-94-1	11.04	1		III3B	410	0.00
8-10	Acetone	67-64-1		10			1200	0.01

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
<b>9</b>	<b>Acids</b>							
9-1	Acetic acid	64-19-7	4.95	83	35		1200	0.07
9-2	Propionic acid	79-09-4	6.05	1			1500	0.00
<b>10</b>	<b>Esters</b>							
10-12	2-Ethylhexyl acetate	103-09-3	16.11	1			350	0.00
<b>12</b>	<b>Others</b>							
12-4	Octamethylcyclotetra-siloxane (D4)	556-67-2	12.22	1		Repr. 2	1200	0.00
12-12	Decamethylcyclopentasiloxane (D5)	541-02-6	15.5	9	7		1500	0.01
12-13	Dodecamethylcyclohexasiloxane (D6)	540-97-6	19.14	18	12		1200	0.02
12-16	Tetradecamethylcycloheptasiloxane (D7)	107-50-6	22.77	6	6		1200	0.01
<b>13</b>	<b>Other identified substances in addition to LCI list</b>							
	Hexamethylcyclotrisiloxane (D3)	541-05-9	8.67	4				
	Acetamide	60-35-5	7.55	2		Carc. 2		
	Formamide	75-12-7	6.28	3		Repr. 1B		
	Multiple superimposed VOC*		4.16	6	6			
	m/z 79*		4.42	5	5			
	Dimethyl sulfoxide*		9.34	1				
	m/z 41 59*		10.79	1				
2-10	Other saturated aliphatic hydrocarbons C10 to C13*	--	13.2-18.5	50	50		6000	0.01
	m/z 57 73		18.93	46	46			
	Isopropyl acetophenone*		20.54	3				
	Isopropyl acetophenone*		21.31	1				
	Aromatic compound m/z 115 145 160*		21.65	2				
	Diacetyl benzene*		22.95	11	11			

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
	Diacetyl benzene*		23.3	2				
	m/z 43 177*		23.45	1				
	m/z 43 121 163*		23.6	3				
	m/z 43 163*		24.24	1				
	Siloxane, SVOC*		25.19	2				

+ 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: Kategorie 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)	3	3.8
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	170	210
Sum of VOC according to AgBB 2018 / DIBt	220	280
Sum of VOC according to eco-INSTITUT-Label	270	340
Sum of VOC according to ISO 16000-6	230	290

TSVOC, Total semi volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² · h)]
Sum of SVOC according to DIN EN 16516	< 5	< 6.25
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 6.25
Sum of SVOC without LCI according to eco-INSTITUT-Label	2	2.5
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	21	26
Sum of VVOC according to eco-INSTITUT-Label	28	35

\*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)	57	71
VOC without LCI according to eco-INSTITUT-Label (Sum)	81	100
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)	8	10
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)	40	50
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	3	3.8
C9 - C15 Alkylated benzenes (Sum)	2	2.5
Cresols (Sum)	< 1	< 1.25

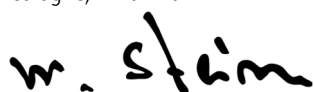
Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.18
R-value according to AgBB 2018 / DIBt	0.11
R-value according to Belgian regulation	0.11
R-value according to AFSSET	0.34

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, 14.01.2021



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



## Appendix

### Sampling sheet

See original test report 55865-001-AgBB-L from 14.01.2021.

## 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  
 Phenyltoluene  
 1-Phenyldecane<sup>2</sup>  
 1-Phenylundecane<sup>2</sup>  
 4-Phenylcyclohexene  
 Styrene  
 β-Methylstyrene  
 Phenylacetylene  
 2-Phenylpropene  
 Vinyltoluene  
 Naphthalene  
 Indene  
 Benzene  
 1-Methylnaphthalene  
 2-Methylnaphthalene  
 1,4-Dimethylnaphthalene

### Saturated aliphatic substances

2-Methylpentane<sup>1</sup>  
 3-Methylpentane<sup>1</sup>  
 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

delta-3-Carene  
 alpha-Pinene  
 beta-Pinene  
 Limonene  
 Longifolene  
 beta-Caryophyllene

alpha-Phellandrene  
 Myrcene  
 Camphene  
 alpha-Terpinene  
 Longipinene

### Aliphatic alcohols and ether

1-Propanol<sup>1</sup>  
 2-Propanol<sup>1</sup>  
 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  
 Ethanol<sup>1</sup>

### Aromatic alcohols (phenoles)

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

### Glycols, Glycol ether, Glycol ester

Propyleneglycol (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  
 Propylene glycol diacetate  
 Dipropylene glycol  
 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 dimethylether  
 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<sup>1,3</sup>  
 3-Methyl-1-butanol  
 Pentanal  
 Hexanal  
 Heptanal  
 2-Ethylhexanal  
 Octanal  
 Nonanal  
 Decanal  
 2-Butenal<sup>3</sup>  
 2-Pentenal<sup>3</sup>  
 2-Hexenal  
 2-Heptenal  
 2-Octenal  
 2-Nonenal  
 2-Decenal  
 2-Undecenal  
 Furfural  
 Ethanedial (Glyoxal)<sup>1,3</sup>  
 Glutaraldehyde  
 Benzaldehyde  
 Acetaldehyde<sup>1,3</sup>  
 Formaldehyde<sup>1,3</sup>  
 Propanal<sup>1,3</sup>  
 Propenal<sup>1,3</sup>  
 Isobutenal<sup>3</sup>

### Ketones

Ethylmethylketone<sup>3</sup>  
 3-Methyl-2-butanone  
 Methylisobutylketone  
 Cyclopentanone  
 Cyclohexanone  
 Acetone<sup>1,3</sup>  
 2-Methylcyclopentanone  
 2-Methylcyclohexanone  
 Acetophenone  
 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<sup>1</sup>  
Ethyl acetate<sup>1</sup>  
Vinyl acetate<sup>1</sup>  
Isopropyl acetate  
Propyl acetate  
2-Methoxy-1-methylethyl acetate  
2-Methoxy-1-propylacetate  
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  
Glutaric acid dimethylester  
Hexandioldiacrylate

Maleic acid dibutylester  
Butyrolactone  
Glutaric acid diisobutylester  
Succinic acid diisobutylester  
Dimethylphthalate  
Diethylphthalate<sup>2</sup>  
Dipropylphthalate<sup>2</sup>  
Dibutylphthalate<sup>2</sup>  
Diisobutylphthalate<sup>2</sup>  
Texanol  
Dipropyleneglycoldiacrylate

#### Chlorinated hydrocarbons

Tetrachlorethene  
1,1,1-Trichlorethane  
Trichlorethene  
1,4-Dichlorbenzene  
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)  
2-n-Octyl-4-isothiazolin-3-one (OIT)  
Triethylamine  
Decamethylcyclopentasiloxane

Dodecamethylcyclohexasiloxane  
Tetradecamethylcycoheptasiloxane  
Tetrahydrofuran (THF)  
1-Octene  
1-Decene  
1-Dodecene  
2-Pentylfuran  
2-Methylfuran  
Isophorone  
Tetramethyl succinonitrile  
Dimethylformamide (DMF)  
Tributyl phosphate  
N-Ethyl-2-pyrrolidone  
Aniline  
4-Vinylcyclohexene  
Dichlormethane  
Carbon tetrachloride  
Chlorobenzene  
Chloroform  
Chloroprene (monomer)  
Acetamide  
Formamide  
1,3-Dichlor-2-propanol  
Cyclohexylisocyanate  
Butyl methacrylate  
2-Hexanone  
Azobis[isobutyronitrile]  
Benzophenone  
1-Buthyl-2-pyrrolidone  
Acroleine  
Furfuryl alcohol  
Decahydronaphthalene

1 VVOC

2 SVOC

3 Analyse gem. DIN ISO 16000 3:2013-01

## Definition of terms

VOC (volatile organic compounds)	All individual compounds with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$ , SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI and not calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ calculated as toluene equivalent
TVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ , SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI and not calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$ in the retention range $C_6$ to $C_{16}$
TVOC without LCI according to eco-INSTITUT-Label	Sum of all VOC without NIK $\geq 1 \mu\text{g}/\text{m}^3$ 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 III1 and III2
VVOC (very volatile organic compounds)	All individual substances with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$ with LCI
TVVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VVOC $\geq 1 \mu\text{g}/\text{m}^3$ with LCI
SVOC (semi volatile organic compounds)	All individual substances $\geq 1 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$ without LCI
TSVOC without LCI according to eco-INSTITUT-Label	Sum of all SVOC $\geq 1 \mu\text{g}/\text{m}^3$ without LCI
TSVOC with LCI according to AgBB/DIBt	Sum of all identified and calibrated SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI
SER	Specific emission rate (see "Explanation of Specific Emission Rate SER")
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 $\geq 1 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2018
R value according to AgBB 2018/DIBt	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2018
R value according to Belgian regulation	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the Belgian regulation
R value according to AFSSET	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ 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

## 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 from  $1\mu\text{g}/\text{m}^3$ .

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 standard d8 toluene. The identification and quantification of substances is carried out, as far as technically feasible, from a concentration (evaluation limit) of  $5\mu\text{g}/\text{m}^3$  test chamber air.

### 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 41.7 %. The calculation is based on DIN ISO 11352:2013-03 (Nordtest).

## 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 <sup>2</sup> )	relation between emission and surface
v = unit volume (m <sup>3</sup> )	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 <sub>l</sub>	in µg/(m·h)
surface-specific	SER <sub>a</sub>	in µg/(m <sup>2</sup> ·h)
volume-specific	SER <sub>v</sub>	in µg/(m <sup>3</sup> ·h)
unit specific	SER <sub>u</sub>	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.