eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

Fraunhofer-Institut für Toxikologie und Experimentelle Medizin ITEM
Nikolai-Fuchs-Straße 1
30625 Hannover

Test Report No. 55994-001-L

Test objective:	**Emission analysis / Measurement of formaldehyde reduction with constant formaldehyde dosing**
Name of test sample/item by client:	**MF20**
Sample/batch by client:	**MF20**
Sampled by:	medicpartner GmbH
Date of sampling:	no information
Location of sampling:	Karlsruhe
Date of production:	no information
Date of arrival of sample:	14.01.2021
Test period:	14.01.2021 - 02.02.2021
Date of report:	15.03.2021
Number of pages of report:	24
Testing laboratory:	eco-INSTITUT Germany GmbH, Köln except ‡ subcontracted # outside accreditation
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. More information at www.eco-institut.de/en/advertising

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Sample View

Internal sample number (assigned by the laboratory)	Test sample/item by client	Sample/batch by client	Condition upon delivery	Type of sample
55994-A001	MF20	MF20	without objection	Luftreiniger

55994-A001

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:	18.01.2021
Sample preparation:	Unit set up in the middle of the test chamber on a stand as described in the operating instructions under "Horizontal wall Mounting", i.e. lying horizontally on its side, but without a boundary in the "back". Measurement of self-emission in operation, then continuous doping of >500 µg/m³ formaldehyde into the test chamber air. Measurement times as follows: 1h after switch-on: VOC + AK, 4h after switch-on: FA, 8h after switch-on: FA, 24h after switch-on: VOC + AK
Masking of backside:	not applicable
Masking of edges:	no
Relationship of unmasked edges to surface:	not applicable
Loading:	related to the entire unit
Dimensions:	complete sample

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

Chamber volume:	20 m³
Temperature:	23°C ± 1°C
Relative humidity:	50 % ± 1 %
Air pressure:	normal
Air:	determination of self-emission: cleaned formaldehyde dosing: cleaned, spiked with formaldehyde, target concentration >500 µg/m³
Air change rate:	0.2 h^{-1}
Air velocity:	0.3 m/s
Loading:	1 unit/m³
Specific air flow rate:	0.2 m³/(unit · h)
Air sampling:	self-emission: 24h after test chamber loading formaldehyde dosing: concentration control in the test chamber with the unit switched off 1 hour after switching on the unit 4 hours after switching on the unit 8 hours after switching on the unit 1 day 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: 5 µg/m³)
Note for analysis:	not specified

Brief description

The MF20 air purification unit was placed in a 20 m³ stainless steel emission test chamber and switched on. The emission test chamber was supplied with purified air and operated at 23°C and 50% rH with an air exchange rate of 0.5/h. After 24 hours, air sampling was performed to determine the self-emission of the switched-on unit. Afterwards the unit was switched off and the test chamber air was spiked with formaldehyde. The air exchange rate was reduced to 0.2/h. Before the unit was switched on, the formaldehyde concentration in the test chamber was determined with 670 µg/m³. For dosing control, the concentration of the doping line was also determined to be 2300 µg/m³. The unit was switched on and the first measuring point was taken 1 hour after commissioning. VOC was determined according to DIN ISO 16000-6:2012-11 and aldehydes/ketones according to DIN ISO 16000-3:2013-01. The formaldehyde concentration was determined at the measuring times 4 hours after commissioning and 8 hours after commissioning. At the time of measurement 24 hours after commissioning, VOCs were determined in accordance with DIN ISO 16000-6:2012-11 and aldehydes/ketones in accordance with DIN ISO 16000-3:2013-01. At the time of measurement 24 hours after commissioning of the unit, the formaldehyde concentration of the doping line was also determined at 2200 µg/m³, which corresponds to a test chamber concentration of 640 µg/m³. The formaldehyde concentration averaged over the test period of 24 hours was 655 µg/m³ and can be considered constant within the measurement uncertainty.

1.1 Determination of self-emission, Volatile Organic Compounds

Test objective:
Volatile Organic Compounds (VOC), test chamber, air sampling 24 hours after test chamber loading, measurement with the unit switched on

Test result:

Carrier material:	55994-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
5	**Aromatic alcohols**							
5-1	Phenol	108-95-2	12.44	7	5	Muta. 2	70	0.10
7	**Aldehydes**							
7-3	Hexanal	66-25-1	8.59	1			900	0.00
7-4	Heptanal	111-71-7	10.84	1			900	0.00
7-6	Octanal	124-13-0	13.11	1			900	0.00
7-7	Nonanal	124-19-6	15.3	3			900	0.00
7-19	Benzaldehyde	100-52-7	12.53	17	12		90	0.19
8	**Ketones**							
8-8	Acetophenone	98-86-2	14.81	10	8		490	0.02
9	**Acids**							
9-1	Acetic acid	64-19-7	4.69	6			1200	0.01
9-9	n-Octanoic acid (Caprylic acid)	124-07-2	16.75	1			2100	0.00
13	**Other identified substances in addition to LCI list**							
	not identified. VVOC m/z 46		4.14	2				
	aromatic compound m/z 96 124*		10.84	1				
	Phenylacetaldehyd*		14.27	2				
	aromatic compound m/z 51 77 105*		14.81	8	8			

No.	Substance	CAS No.	RT	Concentration+ Substances ≥ 1 µg/m³	Toluene-equivalent Substances ≥ 5 µg/m³	CMR Classifi-cation++	LCI AgBB 2018	R-value
			[min]	[µg/m³]	[µg/m³]		[µg/m³]	
	aromatic compound m/z 51 77 105*		14.96	14	14			
	Methylbenzoat*		15.36	2				
	Benzoic acid*		16.75	95	95			
	Salicylic acid ester m/z 92 120 152*		17.56	1				
	aromatic compound m/z 51 77 105*		19.84	5	5			
	aromatic compound m/z 102 174*		24.54	6	6			
	aromatic compound m/z 69 94*		24.84	1				
	several not identified SVOC-compounds*		25.1-31.9	20	20			

+ 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*	Self-emission Concentration after 24 hours [µg/m³]	SER_u [µg/(u • 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	< 0.2
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 0.2

TVOC, Total volatile organic compounds	Self-emission Concentration after 24 hours [µg/m³]	SER_u [µg/(u • h)]
Sum of VOC according to DIN EN 16516	150	31
Sum of VOC according to AgBB 2018 / DIBt	170	34
Sum of VOC according to eco-INSTITUT-Label	180	36
Sum of VOC according to ISO 16000-6	190	38

TSVOC, Total semi volatile organic compounds	Self-emission Concentration after 24 hours [µg/m³]	SER_u [µg/(u • h)]
Sum of SVOC according to DIN EN 16516	20	4
Sum of SVOC without LCI according to AgBB 2018 / DIBt	20	4
Sum of SVOC without LCI according to eco-INSTITUT-Label	20	4
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 1

TVVOC, Total very volatile organic compounds	Self-emission Concentration after 24 hours [µg/m³]	SER_u [µg/(u • h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	< 5	< 1
Sum of VVOC according to eco-INSTITUT-Label	2	0.4

*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	Self-emission Concentration after 24 hours [µg/m³]	SER_u [µg/(u • h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (sum)	130	26
VOC without LCI according to eco-INSTITUT-Label (sum)	140	27
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)	7	1.4
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	17	3.4
Bicyclic Terpenes (Sum)	< 1	< 0.2
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 0.2
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	6	1.2
C9 - C15 Alkylated benzenes (Sum)	< 1	< 0.2
Cresols (Sum)	< 1	< 0.2

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.32
R-value according to AgBB 2018 / DIBt	0.31
R-value according to Belgian regulation	0.31
R-value according to AFSSET	0.58

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 Formaldehyde doping: Sample A001, Volatile Organic Compounds 1 hour after after commissioning the unit

Test objective:

Volatile Organic Compounds (VOC), test chamber, air sampling 1 hour after after commissioning the unit, continuous formaldehyde dosing of the test chamber air to 670 µg/m³

Test result:

sample: | 55994-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
4	**Aliphatic mono alcohols (n-, iso-, cyclo-) and dialcohols**							
4-3	2-Propanol	67-63-0	4.12	2		Group 3		
5	**Aromatic alcohols**							
5-1	Phenol	108-95-2	12.43	5		Muta. 2	70	0.07
7	**Aldehydes**							
7-3	Hexanal	66-25-1	8.58	1			900	0.00
7-7	Nonanal	124-19-6	15.29	3			900	0.00
7-19	Benzaldehyde	100-52-7	12.51	11	8		90	0.12
7-20	Acetaldehyde	75-07-0		5		Carc. 2	1200	0.00
(7-22) [1)]	*(Formaldehyde) [1)]*	*(50-00-0) [1)]*		*(410) [1)]*		*(Carc. 1B Muta. 2) [1)]*	*(100) [1)]*	*(4.10) [1)]*
8	**Ketones**							
8-8	Acetophenone	98-86-2	14.79	7	5		490	0.01
8-10	Acetone	67-64-1		5			1200	0.00
9	**Acids**							
9-1	Acetic acid	64-19-7	4.7	8			1200	0.01
12	**Others**							
12-15	Dimethylformamide (DMF)	68-12-2	8.11	1		Repr. 1B	15	0.07

[1)] Test chamber supply air spiked with 670 µg/m³ formaldehyde. Formaldehyde is therefore excluded from the emission assessment.

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							
	Benzene	71-43-2	6.14	1		Carc. 1A Muta. 1B		
	Cyclohexylisocyanate*	3173-53-3	13.33	1				
	not identified VVOC m/z 46*		4.13	2				
	Trioxane*		6.44	1				
	m/z 44 60 87*		7.69	1				
	m/z 44 60*		9.12	1				
	Phenylacetaldehyd*		14.26	2				
	aromatic compound m/z 51 77 105*		14.94	8	8			
	Methylbenzoat*		15.35	2				
	Benzoic acid*		16.65	63	63			
	aromatic compound m/z 51 77 105*		19.82	4				
	aromatic compound presum. Phenyl maleic anhydride*		24.53	4				
	Carboxylic acid*		28.92	1				
	aromatic compound m/z 51 77 105*		31	1				

+ 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*	Formaldehyde doping: concentration after 1 hour [µg/m³]	SER_{II} [µg/(u • 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)	2	0.4
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	1	0.2

TVOC, Total volatile organic compounds	Formaldehyde doping: concentration after 1 hour [µg/m³]	SER_{II} [µg/(u • h)]
Sum of VOC according to DIN EN 16516	84	17
Sum of VOC according to AgBB 2018 / DIBt	100	20
Sum of VOC according to eco-INSTITUT-Label	120	25
Sum of VOC according to ISO 16000-6	150	30

TSVOC, Total semi volatile organic compounds	Formaldehyde doping: concentration after 1 hour [µg/m³]	SER_{II} [µg/(u • h)]
Sum of SVOC according to DIN EN 16516	< 5	< 1
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 1
Sum of SVOC without LCI according to eco-INSTITUT-Label	2	0.4
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 1

TVVOC, Total very volatile organic compounds	Formaldehyde doping: concentration after 1 hour [µg/m³]	SER_{II} [µg/(u • h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	10	2
Sum of VVOC according to eco-INSTITUT-Label	14	2.8

*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	Formaldehyde doping: concentration after 1 hour [µg/m³]	SER_u [µg/(u • h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (sum)	71	14
VOC without LCI according to eco-INSTITUT-Label (sum)	88	18
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)	10	2
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	11	2.2
Bicyclic Terpenes (Sum)	< 1	< 0.2
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 0.2
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	4	0.8
C9 - C15 Alkylated benzenes (Sum)	< 1	< 0.2
Cresols (Sum)	< 1	< 0.2

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.29
R-value according to AgBB 2018 / DIBt	0.22
R-value according to Belgian regulation	0.22
R-value according to AFSSET	0.44

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)] Test chamber supply air spiked with 670 µg/m³ formaldehyde. Formaldehyde is therefore excluded from the emission assessment.

1.3 Sample A001, Volatile Organic Compounds after 1 day

Test objective:
Volatile Organic Compounds (VOC), test chamber, air sampling 1 hour after after commissioning the unit, continuous formaldehyde dosing of the test chamber air to 670 µg/m³

Test result:

sample:	55994-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
1	**Aromatic hydrocarbons**							
1-26	Phenyl acetylene	536-74-3	10.48	2			200	0.01
5	**Aromatic alcohols**							
5-1	Phenol	108-95-2	12.44	15	9	Muta. 2	70	0.21
7	**Aldehydes**							
7-3	Hexanal	66-25-1	8.59	2			900	0.00
7-6	Octanal	124-13-0	13.11	2			900	0.00
7-7	Nonanal	124-19-6	17.39	6	5		900	0.01
7-8	Decanal	112-31-2	17.39	1			900	0.00
7-19	Benzaldehyde	100-52-7	12.53	36	27		90	0.40
7-20	Acetaldehyde	75-07-0		5		Carc. 2	1200	0.00
(7-22) [1)]	*(Formaldehyde) [1)]*	*(50-00-0) [1)]*		*(84) [1)]*		*(Carc. 1B Muta. 2) [1)]*	*(100) [1)]*	*(0.84) [1)]*
8	**Ketones**							
8-8	Acetophenone	98-86-2	14.8	19	15		490	0.04
8-10	Acetone	67-64-1		6			1200	0.01
9	**Acids**							
9-1	Acetic acid	64-19-7	4.71	10			1200	0.01
9-2	Propionic acid	79-09-4	5.98	1			1500	0.00

1) Test chamber supply air spiked with 670 µg/m³ formaldehyde. Formaldehyde is therefore excluded from the emission assessment.

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
12	**Others**							
12-15	Dimethylformamide (DMF)	68-12-2	8.12	1		Repr. 1B	15	0.07
13	**Other identified substances in addition to LCI list**							
	Benzene	71-43-2	6.14	2		Carc. 1A Muta. 1B		
	Cyclohexylisocyanate*	3173-53-3	13.33	1				
	not identified VVOC m/z 46*		4.13	5	5			
	m/z 44 60 87*		7.69	1				
	Phenylacetaldehyd*		14.26	4				
	aromatic compound m/z 51 77 105*		14.96	31	31			
	Methylbenzoat*		15.35	4				
	Benzoic acid*		16.96	200	200			
	Salicylic acid ester m/z 92 120 152*		17.55	3				
	aromatic compound m/z 51 77 105*		19.84	11	11			
	aromatic compound m/z 77 105 147*		20.16	1				
	aromatic compound m/z 51 77 105*		22.43	1				
	aromatic compound presum. Phenyl maleic anhydride*		24.55	13	13			
	aromatic compound m/z 69 94*		24.87	2				
	aromatic compound m/z 69 105 147*		26.44	3				
	aromatic compound m/z 77 105*		27.07	1				
	Carboxylic acid*		28.92	1				
	aromatic compound m/z 51 77 105*		29.06	1				
	aromatic compound m/z 51 77 105*		29.51	4				
	aromatic compound m/z 51 77 105*		31	4				

+ 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 24 hours [µg/m³]	SER_u [µg/(u • 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	0.6
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	2	0.4

TVOC, Total volatile organic compounds	Concentration after 24 hours [µg/m³]	SER_u [µg/(u • h)]
Sum of VOC according to DIN EN 16516	320	63
Sum of VOC according to AgBB 2018 / DIBt	350	69
Sum of VOC according to eco-INSTITUT-Label	370	75
Sum of VOC according to ISO 16000-6	380	76

TSVOC, Total semi volatile organic compounds	Concentration after 24 hours [µg/m³]	SER_u [µg/(u • h)]
Sum of SVOC according to DIN EN 16516	< 5	< 1
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 1
Sum of SVOC without LCI according to eco-INSTITUT-Label	14	2.8
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 1

TVVOC, Total very volatile organic compounds	Concentration after 24 hours [µg/m³]	SER_u [µg/(u • h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	11	2.2
Sum of VVOC according to eco-INSTITUT-Label	11	2.2

*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 24 hours [µg/m³]	SER_u [µg/(u • h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	260	52
VOC without LCI according to eco-INSTITUT-Label (Sum)	280	56
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)	20	4
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	36	7.2
Bicyclic Terpenes (Sum)	< 1	< 0.2
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 0.2
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	11	2.2
C9 - C15 Alkylated benzenes (Sum)	< 1	< 0.2
Cresols (Sum)	< 1	< 0.2

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.76
R-value according to AgBB 2018 / DIBt	0.68
R-value according to Belgian regulation	0.68
R-value according to AFSSET	1.26

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.

[7] Test chamber supply air spiked with 670 µg/m³ formaldehyde. Formaldehyde is therefore excluded from the emission assessment.

1.4 Formaldehyde concentration: supply air, test chamber air

Test objective:
Formaldehyde, dosing control of supply air and test chamber air concentration

Test method:

Analytics:	DIN ISO 16000-3:2013-01 (DNPH-method)
Limit of determination:	2 µg/m³

Test result:

Internal sample number:	55994-A001

Measuring time (hours after commissioning):	Concentration (test chamber air) [µg/m³]	Concentration (dosing line) [µg/m³]
Concentration control in the test chamber (before starting the test)	670	2300
Correlating concentration dosing line after 24 hours	calculated: 640 µg/m³	2200
Mean value for calculation	655	2250

< q.l. = Value below quantification limit

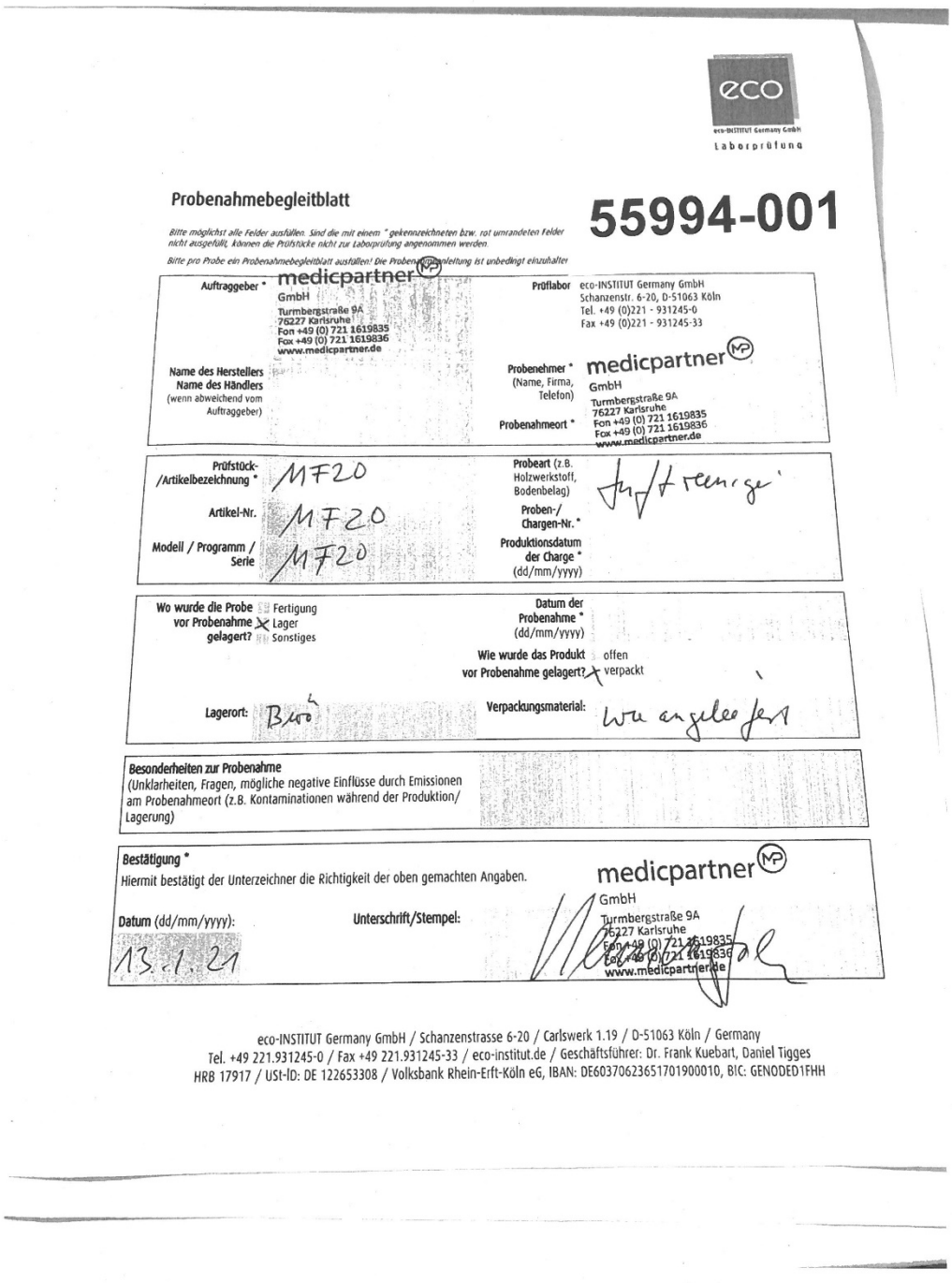
Measuring time (hours after commissioning):	Concentration (test chamber air) [µg/m³]	Mean concentration dosage [µg/m³]	Recovery [%]
1	410	655	62.6
4	210	655	32.1
8	140	655	21.4
24	84	655	12.8

Cologne, 09.03.2021

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

Appendix

Sampling sheet



eco
eco-INSTITUT Germany GmbH
Laborprüfung

Probenahmebegleitblatt **55994-001**

*Bitte möglichst alle Felder ausfüllen. Sind die mit einem * gekennzeichneten bzw. rot umrandeten Felder nicht ausgefüllt, können die Prüfstücke nicht zur Laborprüfung angenommen werden.*

Bitte pro Probe ein Probenahmebegleitblatt ausfüllen! Die Probenahmeanleitung ist unbedingt einzuhalten

Auftraggeber * medicpartner GmbH, Turmbergstraße 9A, 76227 Karlsruhe, Fon +49 (0) 721 1619835, Fax +49 (0) 721 1619836, www.medicpartner.de	**Prüflabor** eco-INSTITUT Germany GmbH, Schanzenstr. 6-20, D-51063 Köln, Tel. +49 (0)221 - 931245-0, Fax +49 (0)221 - 931245-33
Name des Herstellers / Name des Händlers (wenn abweichend vom Auftraggeber)	**Probenehmer *** (Name, Firma, Telefon) medicpartner GmbH, Turmbergstraße 9A, 76227 Karlsruhe, Fon +49 (0) 721 1619835, Fax +49 (0) 721 1619836, www.medicpartner.de
	Probenahmeort *
Prüfstück-/Artikelbezeichnung * MF20	**Probeart** (z.B. Holzwerkstoff, Bodenbelag) Hautreiniger
Artikel-Nr. MF20	**Proben-/Chargen-Nr. ***
Modell / Programm / Serie MF20	**Produktionsdatum der Charge *** (dd/mm/yyyy)
Wo wurde die Probe vor Probenahme gelagert? ☐ Fertigung ☒ Lager ☐ Sonstiges	**Datum der Probenahme *** (dd/mm/yyyy)
	Wie wurde das Produkt vor Probenahme gelagert? ☐ offen ☒ verpackt
Lagerort: Büro	**Verpackungsmaterial:** wie angeliefert

Besonderheiten zur Probenahme
(Unklarheiten, Fragen, mögliche negative Einflüsse durch Emissionen am Probenahmeort (z.B. Kontaminationen während der Produktion/ Lagerung)

Bestätigung *
Hiermit bestätigt der Unterzeichner die Richtigkeit der oben gemachten Angaben.

Datum (dd/mm/yyyy): 13.1.21

Unterschrift/Stempel: medicpartner GmbH, Turmbergstraße 9A, 76227 Karlsruhe, Fon +49 (0) 721 1619835, Fax +49 (0) 721 1619836, www.medicpartner.de

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 / Volksbank Rhein-Erft-Köln eG, IBAN: DE60370623651701900010, BIC: GENODED1FHH

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
delta-3-Caren
alpha-Pinene
beta-Pinene
Limonene
(iso)Longifolene
beta-Caryophyllene
alpha-Phellandrene
Myrcene
Camphene
alpha-Terpinene
Longipinene

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
Ethanol[1]

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
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 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
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]
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[1]
Ethyl acetate[1]
Vinyl acetate[1]
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[2]
Dipropylphthalate[2]
Dibutylphthalate[2]
Diisobutylphthalate[2]
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-Pentylfurane
2-Methylfurane
Isophorone
Tetramethyl succinonitrile
Dimethylformamide (DMF)
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
Benzothiazole

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 ≥ 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 "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 ≥ 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 ≥ 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 ≥ 5 µg/m³ with LCI, established by the Belgian regulation
R value according to AFSSET	R value for all identified and calibrated VOC ≥ 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

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 1µg/m³.

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 signa 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 µg/m3 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^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.