eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

KERAKOLL SpA Headquarter
via Pedemontana, 25
41049 Sassuolo (MO)
Italy

Test Report No. 59213-A018-A019-AgBB-L

Test objective:	**Evaluation according to AgBB scheme 2021**
Article designation according to order:	**Microresina Xtreme Invisible**
Date of report:	20/08/2024
Number of pages of report:	20
Testing / responsible laboratory:	eco-INSTITUT Germany GmbH, Köln
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

Content

Sample View

Internal sample number (filled in by laboratory)	**59213-A018**
Article designation according to order:	Microresina Xtreme Invisible (Part A)
Sample/batch number according to order:	K43023615
Type of sample:	Micro resin
Date of production:	28/07/2023
Sampling by:	Alberto Spaggiari
Date of sampling:	17/06/2024
Location of sampling:	Warehouse
Receipt of sample / Condition upon delivery:	20/06/2024 / without objection

Internal sample number (filled in by laboratory)	**59213-A019**
Article designation according to order:	Microresina Xtreme Invisible (Part B)
Sample/batch number according to order:	K43023615
Type of sample:	Micro resin
Date of production:	28/07/2023
Sampling by:	Alberto Spaggiari
Date of sampling:	17/06/2024
Location of sampling:	Warehouse
Receipt of sample / Condition upon delivery:	20/06/2024 / without objection

Photo of the test specimen: A018-A019

Statement of conformity with AgBB 2021

The samples with the internal sample numbers 59213-A018 and 59213-A019 have been tested on behalf of **KERAKOLL SpA Headquarter.** The article description according to the order is **Microresina Xtreme Invisible**.

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 2021).

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			
Sum VOC (C6-C16) [1)]	0.63 mg/m³	≤ 10 mg/m³	yes
Carcinogenic substances, cat. 1A and 1B acc. to Regulation (EC) No. 1272/2008 (and TRGS 905) (per substance)	≤ 0.01 mg/m³	≤ 0.01 mg/m³	yes
Measurement time: 28 days after test chamber loading			
Sum VOC (C6-C16) including SVOC with LCI [1)]	0.071 mg/m³	≤ 1.0 mg/m³	yes
Sum SVOC without LCI (C16-C22) [1)]	< 0.005 mg/m³	≤ 0.1 mg/m³	yes
R-value (dimensionless)	0.93	≤ 1	yes
Sum VOC without LCI	0.007 mg/m³	≤ 0.1 mg/m³	yes
Carcinogenic substances, cat. 1A and 1B acc. to Regulation (EC) No. 1272/2008 (and TRGS 905) (per substance)	≤ 0.001 mg/m³	≤ 0.001 mg/m³	yes

1) For sum VOC (C6-C16) and sum SVOC (C16-C22) only substances ≥ 5 µg/m³ are considered.

[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 statement of conformity with AgBB 2021

The samples with the internal sample numbers 59213-A018 and 59213-A019, article description according to order: **Microresina Xtreme Invisible**, meet the emission requirements of the AgBB scheme.

Cologne, 20/08/2024

Marc-Anton Dobaj, M.Sc. Crystalline Materials
(Project management)

Laboratory report

1 Emission analysis

Test method

DIN EN 16516:2020-10	Testing and evaluation of the release of dangerous substances; determination of emissions into indoor air

A018, A019, Preparation of test specimen

Date:	03/07/2024
Test specimen preparation:	Application on glass; with a brush; mixing ratio sample A018 and A019 10:1; afterwards diluted with 10% water; 1st layer: application quantity 62 g/m²; 2nd layer: application quantity 62 g/m²; 3rd layer: application quantity 62 g/m²; Intermediate drying between 1st and 2nd layer 24 hours; Intermediate drying between 1st and 2nd layer 24 hours; drying / pre-conditioning outside of the test chamber for 72 hours
Masking of backside:	not applicable
Masking of edges:	not applicable
Relationship of unmasked edges to surface:	not applicable
Loading reference unit:	area-specific [m²]
Dimensions:	2 x 25.0 cm x 20.0 cm with 3.1 g application per layer

A018, A019, Test chamber conditions according to DIN EN ISO 16000-9:2008-04

Chamber volume:	0.100 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:	1.0 m²/m³
Specific air flow rate:	0.5 m³/(m²·h)
Starting time of the test (t0):	08/07/2024
Air sampling:	3 days after test chamber loading 28 days after test chamber loading

Analytics

Aldehydes and ketones:	DIN ISO 16000-3:2023-12
Limit of quantification:	2 µg/m³
Volatile organic compounds:	DIN ISO 16000-6:2022-03
Limit of quantification:	1 µg/m³ (1,4-Cyclohexanedimethanol, Diethylene glycol, 1,4-Butanediol: 5 µg/m³)
Note for analysis:	not specified

1.1 Sample A018, A019, 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:	59213-A018 59213-A019

	Substance	CAS No.	RT [min]	Concentration+ calib. substances ≥ 1 µg/m³ uncalib. substances ≥ 1 µg/m³ DNPH ≥ 2 µg/m³ [µg/m³]	Toluene-equivalent substances ≥ 5 µg/m³ [µg/m³]	SER+ [µg/(m²·h)]	CMR Classification++	LCI AgBB 2021 [µg/m³]	R-value
	Aromatic alcohols								
VOC	2,6-Di-tert-butyl-4-methylphenol (BHT)	128-37-0	24.29	14	21	7	Group 3	100	0.14
	Glycols, Glycol ethers, Glycol esters								
VOC	Diethylene glycol monobutyl ether	112-34-5	17.40	13	18	6.5		350	0.04
VOC	Dipropylene glycol monomethyl ether	34590-94-8	13.24	4	< 5	2		3100	0.00
VOC	Dipropylene glycol monomethyl ether acetate	88917-22-0	16.63	1	< 5	0.5		950	0.00
VOC	Dipropylene glycol mono-n-butyl ether	29911-28-2	18.61	240	240	120		250	0.96
VOC	Ethyldiglycol, (Diethylene glycol monoethyl ether, 2-(2-Ethoxyethoxy)ethanol)	111-90-0	13.34	150	120	75		350	0.43
VOC	Dipropylene glycol dimethyl ether	111109-77-4	13.5 + 13.8	4	< 5	2		1300	0.00
	Aldehydes								
VVOC	Propanal	123-38-6		5	n. d.	2.5		650	0.01
VVOC	Formaldehyde	50-00-0		9	n. d.	4.5	Carc. 1B Muta. 2	100	0.09
	Acids								
VOC	Acetic acid	64-19-7	4.36	2	< 5	1		1200	0.00
	Others								
VOC	Triethylamine	121-44-8	6.33	180	110	90		60	3.00

	Substance	CAS No.	RT [min]	Concentration+ calib. substances ≥ 1 µg/m³ uncalib. substances ≥ 1 µg/m³ DNPH ≥ 2 µg/m³ [µg/m³]	Toluene-equivalent substances ≥ 5 µg/m³ [µg/m³]	SER+ [µg/(m²·h)]	CMR Classifi-cation++	LCI AgBB 2021 [µg/m³]	R-value
	Other identified substances in addition to LCI list								
VVOC	not ident. VVOC, m/z 61*		4.27	1	< 5	0.5			
VVOC	Diethylamine*		4.50	5	5	2.5			
VOC	not ident. VOC, m/z 91 61*		5.82	2	< 5	1			
VOC	N,N-Diethylformamide*		11.91	2	< 5	1			
VOC	N-Methyl-Cyclohexylamine*		11.99	2	< 5	1			
VOC	N,N-Dimethyl-Cyclohexylamine*		13.26	21	21	11			
VOC	not ident. VOC, m/z 59*		13.57	8	8	4			
VOC	Glycol, m/z 45 41*		15.47	1	< 5	0.5			
VOC	not ident. VOC, m/z 57 59 101*		18.94	2	< 5	1			
VOC	Glycol, m/z 59 103*		19.07	6	6	3			
VOC	not ident. VOC, m/z 221 207*		23.32	1	< 5	0.5			
VOC	not ident. VOC, m/z 161 203*		23.89	1	< 5	0.5			

+ identified and calibrated substances, substance specific calculated

++ classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A, 1B and 2, Muta. 1A, 1B and 2, Repr. 1A, 1B and 2, TRGS 905: K1A, K1B, K2, M1A, M1B, M2, R1A, R1B, R2; IARC: Group 1, 2A, 2B and 3, DFG MAK-list: Categorie III1 to III5

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

n. d.: not determined

Carcinogenic, mutagenic, and reproductive toxic compounds*	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	< 0.5
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B; TRGS 905: K1A, K1B (sum)	< 1	< 0.5

TVOC, Total volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to DIN EN 16516	540	270
Sum of VOC according to AgBB 2021	630	320
Sum of VOC according to eco-INSTITUT-Label	650	330
Sum of VOC according to DIN ISO 16000-6	580	290

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	< 2.5
Sum of SVOC without LCI according to AgBB 2021	< 5	< 2.5
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 0.5
Sum of SVOC with LCI according to AgBB 2021	< 5	< 2.5

TVVOC, Total very volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VVOC according to AgBB 2021	19	9.5
Sum of VVOC according to eco-INSTITUT-Label	20	10

*Excluding formaldehyde and acetaldehyde (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 and protocol of the 11th meeting of 'Ausschusses für Innenraumrichtwerte' (AIR), 11/2020). In the case of a toxicological emission assessment, a single-substance analysis of the concentrations 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 2021 (sum)	35	18
VOC without LCI according to eco-INSTITUT-Label (sum)	46	23
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: K2, M2, R2; IARC: Group 2B; DFG (MAK list): Category III3 (sum)	9	4.5
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV; Regulation (EC) No. 1272/2008: skin sensitising, respiratory sensitising; TRGS 907 (sum)	9	4.5
Bicyclic Terpenes (sum)	< 1	< 0.5
C9 - C14 Alkanes / Isoalkanes as dekane-equivalent (sum)	< 1	< 0.5
C4 - C11 Aldehydes, acyclic, aliphatic (sum)	< 2	< 1
C9 - C15 Alkylated benzenes (sum)	< 1	< 0.5
Cresols (sum)	< 1	< 0.5

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	4.67
R-value according to AgBB 2021	4.66
R-value according to Belgian regulation	4.66
R-value according to EU-LCI	4.67

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 16516:2020-10. 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 16516:2020-10.

1.2 Sample A018, A019, 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:	59213-A018 59213-A019

	Substance	CAS No.	RT [min]	Concentration+ calib. substances ≥ 1 µg/m³ uncalib. substances ≥ 1 µg/m³ DNPH ≥ 2 µg/m³ [µg/m³]	Toluene-equivalent substances ≥ 5 µg/m³ [µg/m³]	SER+ [µg/(m²·h)]	CMR Classifi-cation++	LCI AgBB 2021 [µg/m³]	R-value
	Aromatic alcohols								
VOC	2,6-Di-tert-butyl-4-methylphenol (BHT)	128-37-0	24.28	2	< 5	1	Group 3	100	0.02
	Glycols, Glycol ethers, Glycol esters								
VOC	Diethylene glycol monobutyl ether	112-34-5	17.39	1	< 5	0.5		350	0.00
VOC	Dipropylene glycol mono-n-butyl ether	29911-28-2	18.60	15	16	7.5		250	0.06
VOC	Ethyldiglycol, (Diethylene glycol monoethyl ether, 2-(2-Ethoxyethoxy)ethanol)	111-90-0	13.31	2	< 5	1		350	0.01
	Aldehydes								
VVOC	Formaldehyde	50-00-0		5	n. d.	2.5	Carc. 1B Muta. 2	100	0.05
	Others								
VOC	Triethylamine	121-44-8	6.32	49	31	25		60	0.82
	Other identified substances in addition to LCI list								
VOC	N,N-Dimethyl-Cyclohexylamine*		13.26	7	7	3.5			
VOC	not ident. VOC, m/z 59*		13.31	2	< 5	1			

+ identified and calibrated substances, substance specific calculated

++ classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A, 1B and 2, Muta. 1A, 1B and 2, Repr. 1A, 1B and 2, TRGS 905: K1A, K1B, K2, M1A, M1B, M2, R1A, R1B, R2; IARC: Group 1, 2A, 2B and 3, DFG MAK-list: Categorie III1 to III5

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

n. d.: not determined

Carcinogenic, mutagenic, and reproductive toxic compounds*	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	< 0.5
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B; TRGS 905: K1A, K1B (sum)	< 1	< 0.5

TVOC, Total volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to DIN EN 16516	54	27
Sum of VOC according to AgBB 2021	71	36
Sum of VOC according to eco-INSTITUT-Label	78	39
Sum of VOC according to DIN ISO 16000-6	80	40

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	< 2.5
Sum of SVOC without LCI according to AgBB 2021	< 5	< 2.5
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 0.5
Sum of SVOC with LCI according to AgBB 2021	< 5	< 2.5

TVVOC, Total very volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VVOC according to AgBB 2021	5	2.5
Sum of VVOC according to eco-INSTITUT-Label	5	2.5

*Excluding formaldehyde and acetaldehyde (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 and protocol of the 11th meeting of 'Ausschusses für Innenraumrichtwerte' (AIR), 11/2020). In the case of a toxicological emission assessment, a single-substance analysis of the concentrations 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 2021 (sum)	7	3.5
VOC without LCI according to eco-INSTITUT-Label (sum)	9	4.5
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: K2, M2, R2; IARC: Group 2B; DFG (MAK list): Category III3 (sum)	5	2.5
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV; Regulation (EC) No. 1272/2008: skin sensitising, respiratory sensitising; TRGS 907 (sum)	5	2.5
Bicyclic Terpenes (sum)	< 1	< 0.5
C9 - C14 Alkanes / Isoalkanes as dekane-equivalent (sum)	< 1	< 0.5
C4 - C11 Aldehydes, acyclic, aliphatic (sum)	< 2	< 1
C9 - C15 Alkylated benzenes (sum)	< 1	< 0.5
Cresols (sum)	< 1	< 0.5

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.96
R-value according to AgBB 2021	0.93
R-value according to Belgian regulation	0.93
R-value according to EU-LCI	0.93

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 16516:2020-10. 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 16516:2020-10.

Cologne, 20/08/2024

m. Stein

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

Appendix

Sampling sheet

eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

Sampling Sheet

59213-018+019

*Please fill in all fields. If the fields marked * are not filled in, the test piece cannot be accepted for laboratory testing.*

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

Order by*	Kerakoll Spa via Pedemontana, 25 41049 Sassuolo (MO) ITALY	**Testing laboratory**	eco-INSTITUT Germany GmbH Schanzenstr. 6-20, Carlswerk 1.19 D - 51063 Köln Tel. +49 (0)221 - 931245-0 Fax +49 (0)221 - 931245-33
☐ **Name of production company**	Kerakoll SpA	**Sampling by*** (name, company, phone)	Alberto Spaggiari +39 0536 816610
☐ **Name of distribution** (if different from production)		**Sampling location***	Wharehouse
Name of test sample/ item*	Microresina Xtreme Invisible	**Product type** (e.g. parquet, floor covering)	
Article number		**Sample/ Batch***	K43023615
Model / Program / Series		**Production date of batch***	28/07/2023
Sample taken from	☐ current production ☒ storage ☐ other	**Sampling date***	17/06/2024
		Storage conditions before sampling	☐ open ☒ packaged
Storage location		**Packaging material**	

Additional information, if applicable / Special issues
Uncertainties, questions, possible negative effects through emissions at place of sampling - e.g. contaminations during production/storage

Validation*
By signing the accuracy of the above-mentioned statements **(sampling)** is affirmed.

Date (dd/mm/yyyy)	17/06/2024	**Signature**	Alberto Spaggiari

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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 (31)
Benzene[4]
1,2,3-Trimethylbenzene
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene
1-Isopropyl-2-methylbenzene
1-Isopropyl-4-methylbenzene
1,2,4,5-Tetramethylbenzene
Ethylbenzene
n-Propylbenzene
Isopropylbenzene (Cumene)[4]
1,3-Diisopropylbenzene
1,4-Diisopropylbenzene
n-Butylbenzene
1-Propenylbenzene (beta-Methylstyrene)
Toluene
2-Ethyltoluene
Vinyltoluene
o-Xylene
m-/p-Xylene
Styrene
Phenylacetylene
2-Phenylpropene (alpha-Methylstyrene)
4-Phenylcyclohexene
1-Phenyloctane
1-Phenyldecane[2]
1-Phenylundecane[2]
Indene
Naphthalene
1-Methylnaphthalene
2-Methylnaphthalene
1,4-Dimethylnaphthalene

Aliphatic hydrocarbons (23)
2-Methylpentane[1]
3-Methylpentane[1]
Methylcyclopentane
n-Hexane
Cyclohexane
Methylcyclohexane
1,4-Dimethylcyclohexane
n-Heptane
2,2,4,6,6-Pentamethylheptane
n-Octane
n-Nonane
n-Decane
n-Undecane
n-Dodecane
n-Tridecane
n-Tetradecane
n-Pentadecane
n-Hexadecane
Decahydronaphthalene
1-Octene
1-Decene
1-Dodecene
4-Vinylcyclohexene

Terpenes (12)
delta-3-Carene
alpha-Pinene
beta-Pinene
alpha-Terpinene
Longipinene
Limonene
Longifolene
Isolongifolene
beta-Caryophyllene
alpha-Phellandrene
Myrcene
Camphene

Aliphatic alcohols and ether (18)
Ethanol[1]
1-Propanol[1]
2-Propanol[1]
2-Methyl-1-propanol
1-Butanol
tert-Butanol
1-Pentanol
1-Hexanol
Cyclohexanol
2-Ethyl-1-hexanol
1-Heptanol
1-Octanol
1-Nonanol
1-Decanol
1,4-Cyclohexandimethanol
4-Hydroxy-4-methyl-pentan-2-one (Diacetone alcohol)
Methyl-tert-butyl ether (MTBE)[1]
Tetrahydrofuran (THF)

Aromatic alcohols (phenoles) (8)
Furfuryl alcohol
Benzyl alcohol
Phenol
2-Phenylphenol (oPP)
BHT (2,6-Di-tert-butyl-4-methylphenol)
o-Cresol
m-/p-Cresol
4-Chloro-3-methylphenol (Chlorocresol)

Glycols, Glycol ether, Glycol ester (49)
Ethyleneglycol (Ethan-1,2-diol)
Propylenglycol (Propane-1,2-diol)
Diethylene glycol
Dipropylene glycol
Neopentyl glycol
Hexyleneglycol
Ethyldiglycol
Ethylene glycol monobutyl ether
Diethylene glycol methyl ether
Diethylene glycol monobutyl ether
Diethylene glycol phenyl ether
Dipropylene glycol-dimetyl ether
Dipropylene glycol mono-n-butyl ether
Dipropylene glycol mono-tert-butyl ether
Dipropylene glycol monomethyl ether
Dipropylene glycol mono-n-propyl ether
Tripropylene glycol monomethyl ether
Triethylene glycol dimethyl ether
1,2-Propylene glycol dimethyl ether
1,2-Propylene glycol-n-propyl ether
1,2-Propylene glycol-n-butyl ether
Butyl glycolate
2-Methoxyethanol
2-Ethoxyethanol
2-Methylethoxyethanol
2-Propoxyethanol
2-Hexoxyethanol
2-(2-Hexoxyethoxy)ethanol
2-Phenoxyethanol
1-Methoxy-2-propanol
2-Methoxy-1-propanol
1-Ethoxy-2-propanol
1-tert-Butoxy-2-propanol
3-Methoxy-1-butanol
1,4-Butanediol
1,2-Dimethoxyethane
1,2-Diethoxyethane
1-Methoxy-2-(2-methoxy-ethoxy)ethane
Ethylene carbonate
Propylene carbonate
2-Methoxy-1-propyl acetate
Diethylene glycol monomethyl ether acetate
2-Methoxyethyl acetate
2-Ethoxyethyl acetate
2-Butoxy ethyl acetate
Dipropylene glycol monomethyl ether acetate
Propylene glycol diacetate
Texanol
TXIB (Texanol isobutyrate)

Aldehydes (26)
Formaldehyde[1,3,4]
Acetaldehyde[1,3,4]
Propanal[1,3]
Butanal[1,3]
3-Methyl-1-butanal
Pentanal
Hexanal
2-Ethylhexanal
Heptanal
Octanal
Nonanal
Decanal
Propenal (Acrolein)[1]
Isobutenal (Methacrolein)[3]
2-Butenal
2-Pentenal[3]
2-Hexenal
2-Heptenal
2-Octenal

2-Nonenal
2-Decenal
2-Undecenal
Ethanedial (Glyoxal)[1,3]
Glutaraldehyde
Furfural
Benzaldehyde

Ketones (15)
Acetone[1,3]
1-Hydroxyacetone
Ethylmethylketone[3]
Methylisobutylketone
3-Methyl-2-butanone
Cyclopentanone
2-Methylcyclopentanone
Cyclohexanone
2-Methylcyclohexanone
2-Hexanone
2-Heptanone
Acetophenone
Isophorone
Benzophenone[4]
4-Methylbenzophenone[2]

Acids (11)
Acetic acid
Propionic acid
Pivalic acid
Butyric acid
Isobutyric acid
n-Valeric acid
n-Caproic acid
2-Ethylhexanoic acid
n-Heptanoic acid
n-Octanoic acid
Neodecanoic acid

Esters and Lactones (33)
Methyl acetate[1]
Ethyl acetate[1]
Vinyl acetate[1]
Propyl acetate
Isopropyl acetate
2-Methoxy-1-methylethyl acetate
n-Butyl acetate
Isobutylacetate
2-Ethylhexyl acetate
n-Butyl formate
Methyl acrylate
Methyl methacrylate
Butyl methacrylate
Ethyl acrylate
n-Butyl acrylate
2-Ethylhexyl acrylate
2-Ethylhexyl methacrylate
Hexanediol diacrylate
Dipropylene glycol diacrylate
Dimethyl succinate
Dimethyl glutarate
Dimethyl adipate
Dibutyl fumarate
Dibutyl maleate
Diisobutyl succinate
Diisobutyl glutarate
Butyrolactone
Dimethyl phthalate
Diethyl phthalate[2]
Dipropyl phthalate[2]
Dibutyl phthalate[2]
Diisobutyl phthalate[2]
(5-Ethyl-1,3-dioxan-5-yl)methyl acrylate

Chlorinated hydrocarbons (18)
Dichloromethane[1]
Trichloromethane (Chloroform)[4]
Tetrachloromethane
1,2-Dichloroethane[4]
1,1,1-Trichloroethane
2-Chloropropane
1,2,3-Trichloropropane[4]
Trichloroethene[4]
Tetrachloroethene
trans-1,3-Dichloropropene[4]
cis-1,3-Dichloropropene[4]
Chloroprene[4]
1,3-Dichloro-2-propanol[4]
Chlorobenzene
1,4-Dichlorobenzene
alpha-Chlorotoluene[4]
alpha,alpha,alpha-Trichlorotoluene[4]
1,1-Dichlorethene[1]

Cyclic siloxanes (5)
Hexamethylcyclotrisiloxane (D3)
Octamethylcyclotetrasiloxane (D4)
Decamethylcyclopentasiloxane (D5)
Dodecamethylcyclohexasiloxane (D6)
Tetradecamethylcycoheptasiloxane (D7)

Others (42)
1,4-Dioxane[4]
1,2-Dibromoethane[4]
2-Nitropropane[4]
2,3-Dinitrotoluene[4]
2,4-Dinitrotoluene[4]
2,6-Dinitrotoluene[4]
3,4-Dinitrotoluene[2,4]
o-Anisidine[4]
o-Toluidine[4]
4-Chloro-o-toluidine[4]
5-Nitro-o-toluidine[2]
Acrylonitrile[1,4]
2,2'-Azobisisobutyronitrile
Tetramethylsuccinonitrile
Azobenzene[2,4]
Caprolactam
Furan1,4
2-Methylfuran
2-Pentylfuran
Methenamine
Triethylamine
2-Butanonoxime[4]
Triethyl phosphate
Tributyl phosphate[2]
5-Chloro-2-methyl-4-isothiazolin-3-one (CIT)
2-Methyl-4-isothiazolin-3-one (MIT)
2-n-Octyl-4-isothiazolin-3-one (OIT)
Formamide
Dimethylformamide (DMF)
Acetamide
N-Nitrosopyrrolidine[4]
N-Methyl-2-pyrrolidone
N-Ethyl-2-pyrrolidone
N-Butyl-2-pyrrolidone
Aniline[5]
4-Chloroaniline[4]
2-Nitroanisole[4]
Cyclohexyl isocyanate
p-Cresidine[4]
Diethyl sulfate[4]
Epichlorohydrin[4]
5-Ethyl-1,3-dioxan-5-methanol

1 VVOC
2 SVOC
3 Analysis acc. to DIN ISO 16000-3:2023-12 (DNPH)
4 Carcinogens, category 1A and 1B according to Regulation (EC) No 1272/2008 and TRGS 905
5 When analysing with TD-GC-MS, aniline can occur as a thermal decomposition product of other substances (e.g. 1,3-Diphenylguanidine). A cold analytical method is recommended to confirm the result.

(Status: August 2024)

Definition of terms

CAS No. (Chemical Abstracts Service)	International designation standard for chemical substances
CMR	VOCs, VVOCs and SVOCs classified as carcinogenic, mutagenic or toxic for reproduction according to Regulation (EC) No. 1272/2008, TRGS 905, IARC list and DFG (MAK list)
Limit of quantification (LOQ)	Lower limit of quantification in the analytical method within the defined measurement uncertainty
NIK / LCI	Lowest concentration of interest; substance-specific value for health assessment of emissions from products, indicated in µg/m³
RT (retention time)	Total time required for an analyte to pass the column (time between injection and detection of the analyte)
R value	Sum of quotients of concentration and LCI value for all substances for which a LCI value is derived
R value according to AgBB	R-value for all substances ≥ 5 µg/m³ with LCI value, calculated according to the LCI list of the AgBB scheme
R-value according to Belgian regulation	R-value for all substances ≥ 5 µg/m³ with LCI-value, calculated according to the LCI-list of the Belgian regulation
R value according to eco-INSTITUT-Label	R-value for all substances ≥ 1 µg/m³ with LCI value, calculated according to the LCI list of the AgBB scheme
R value according to EU-LCI	R-value for all substances ≥ 5 µg/m³ with EU-LCI value, calculated according to the EU-LCI list of the European Commission
SER	Specific emission rate (see "Explanation of Specific Emission Rate SER")
SVOC (semi volatile organic compound)	Organic compound eluting in the retention range > C_{16} (n-hexadecane) to C_{22} (docosane)
Toluene equivalent	Concentration of a substance quantified by the TIC response factor of toluene (calculation of the concentration by comparing the integral of the substance with the integral of toluene)
TSVOC	Sum of the concentrations of all identified and unidentified semi volatile organic compounds eluting in the retention range > C_{16} (n-hexadecane) to C_{22} (docosane)
TSVOC according to DIN EN 16516	Sum of all SVOC ≥ 5 µg/m³ (as toluene equivalent)
TSVOC with LCI according to AgBB	Sum of all SVOC with LCI ≥ 5 µg/m³ (quantified substance-specific)
TSVOC with LCI according to eco-INSTITUT-Label	Sum of all SVOC with LCI ≥ 1 µg/m³ (quantified substance-specific)
TSVOC without LCI according to AgBB	Sum of all SVOC without LCI ≥ 5 µg/m³ (as toluene equivalent)
TSVOC without LCI according to eco-INSTITUT label	Sum of all calibrated SVOC without LCI ≥ 1 µg/m³ (quantified substance-specific) and all non-calibrated SVOC without LCI ≥ 1 µg/m³ (as toluene equivalent)
TVOC	Sum of the concentrations of all identified and unidentified volatile organic compounds eluting in the retention range from C_6 (n-hexane) to C_{16} (n-hexadecane)

TVOC according to DIN EN 16516	Sum of all VOC ≥ 5 µg/m³ in the retention range C_6 to C_{16}, calculated as toluene equivalent (used i.a. for M1)
TVOC according to AgBB	Sum of all VOCs with LCI ≥ 5 µg/m³ (quantified substance-specific) and all VOCs without LCI ≥ 5 µg/m³ (as toluene equivalent) (used i.a. for the Blue Angel)
TVOC according to eco-INSTITUT-Label	Sum of all calibrated VOC ≥ 1 µg/m³ (quantified substance-specific) and all non-calibrated VOC ≥ 1 µg/m³ (as toluene equivalent) (used i.a. for natureplus)
TVOC according to ISO 16000-6	Total area of the chromatogram in the retention range C_6 – C_{16} as toluene equivalent according to DIN ISO 16000-6, Annex A.1 item 3 (used i.a. for CDPH, BIFMA and the French VOC regulation)
TVOC without LCI according to AgBB	Sum of all VOCs without LCI ≥ 5 µg/m³ as toluene equivalent
TVOC without LCI according to eco-INSTITUT-Label	Sum of all calibrated VOCs without LCI ≥ 1 µg/m³ (quantified substance-specific) and all non-calibrated VOCs without LCI ≥ 1 µg/m³ (as toluene equivalent)
TVVOC	Sum of the concentrations of all identified and unidentified very volatile organic compounds eluting in the retention range < C_6 (n-hexane)
TVVOC according to AgBB	Sum of all VVOC with LCI ≥ 5 µg/m³ (quantified substance-specificic) and all VVOC without LCI ≥ 5 µg/m³ (as toluene equivalent)
TVVOC according to eco-INSTITUT-Label	Sum of all calibrated VVOC ≥ 1 µg/m³ (substance-specific quantified) and all non-calibrated VVOC ≥ 1 µg/m³ (as toluene equivalent)
VOC (volatile organic compound)	Organic compound eluting in the retention range from C_6 (n-hexane) to C_{16} (n-hexadecane)
VVOC (very volatile organic compound)	Organic compound eluting in the retention range < C_6 (n-hexane)

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. Standardised 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 at an air flow rate of 100 mL/min on Tenax and approx. 100 L at an air flow rate of 0.8 L/min on silica gel coated with DNPH (2,4-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 derivatised with DNPH for the determination of formaldehyde and other short-chain carbonyl compounds (C_1 - C_6) are analysed using high-performance liquid chromatography (HPLC).

Over 200 compounds, including volatile organic compounds (C_6 - C_{16}), semi-volatile organic compounds (C_{16} - C_{22}) and – insofar as possible with this method – also very volatile organic compounds (less than C_6) are determined and quantified individually.

All other substances – insofar as 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 toluene.

The determined substance concentrations are corrected using the recovery rate of the internal standard (toluene-d8). Identification and quantification of substances is carried out from a concentration (limit of quantification) of 1 µg per m³ test chamber air or 2 µg/m³ for DNPH-derivatised substances. In the case of highly loaded samples, the evaluation limit of non-calibrated substances is raised in some cases, as it is no longer possible to assign individual, small signals due to the large number of signals.

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 16516:2020-10. 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.