eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

Hilti Entwicklungsgesellschaft mbH
Hiltistrasse 6
86916 Kaufering

Test Report No. 58762-A003-CS-L

Test objective:	**Emission test according to the California Department of Public Health (CDPH) Standard Method v1.2-2017 (CA 01350)**
Article designation according to order:	**Firestop Sleeve CFS-SL GA L** **Tested as a representative for:** - **CP 653**
Date of report:	09/04/2024
Number of pages of report:	24
Testing / responsible laboratory:	eco-INSTITUT Germany GmbH, Köln
Test objective fulfilled:	✓ Standard private office ✓ Standard school classroom
Note:	The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report serves exclusively for submission to the awarding authority for the above-mentioned quality mark. The report is not permitted to be used in product and company advertising. More information at www.eco-institut.de/en/advertising

Content

‡ subcontracted, # outside accreditation

Sample View

Internal sample number (filled in by laboratory)	**58762-A003**
Photo of the test specimen: A003	
Article designation according to order:	Firestop Sleeve CFS-SL GA L
Sample/batch number according to order:	FL 300124
Type of sample:	Sleeve for fire protection
Date of production:	30/01/2024
Sampling by:	Supplier
Date of sampling:	30/01/2024
Location of sampling:	Supplier
Receipt of sample / Condition upon delivery:	01/02/2024 / without objection

Statement of conformity with the criteria of CA 01350 (standard private office)

The sample with the internal sample number 58762-A003 has been tested on behalf of **Hilti Entwicklungsgesellschaft mbH**. The article description according to the order is **Firestop Sleeve CFS-SL GA L.**

This evaluation bases on the test criteria of the „California Department of Public Health (CDPH) Standard Method v1.2–2017 (CA 01350)".

The VOC concentrations are calculated as Specific Emission Rate (SER_a). For the "Estimated Airborne Concentration in a standard private office" the SER_u is divided by an unit-specific flow rate of 10.4 m³/(u • h). This value was calculated specifically for this product in accordance with chapter 4.3.6 "IAQ Concentration Modelling – Modeling parameters for products not specifically addressed in data tables" and acc. to manufacturer's data as follows:

Firestop Sleeve CFS-SL GA L is used to create penetration gaps for cables. The product creates gaps on both sides of the wall, hence one product is assumed to count as 2 penetration gaps during testing.

• *Total number of gaps per room = 2 u*

Calculated unit-specific flow rate: 0.68 h^{-1} / (2 u / 30.6 m³) = 10.4 m³/(u • h)

The results documented in the test report were evaluated as follows (acc. to Target CREL VOCs, CS01350, Table 4-1):[1]

No	Compound Name	CAS-No.	SER_u 14d [µg/(u • h)]	Estimated Airborne Concentration in standard private office* (SERa 14d divided by 10.4 [m³/(u • h)]) [µg/m³]	Allowable Concentration in standard private office [µg/m³]	Requirement hold [yes/no]
7-20	Acetaldehyde	75-07-0	< 0.06	< 0.01	70	yes
-	Benzene	71-43-2	< 0.06	< 0.01	1.5	yes
-	Carbon disulfide	75-15-0	< 0.06	< 0.01	400	yes
-	Carbon tetrachloride	56-23-5	< 0.06	< 0.01	20	yes
-	Chlorbenzene	108-90-7	< 0.06	< 0.01	500	yes
-	Chloroform	67-66-3	< 0.06	< 0.01	150	yes
-	1,4-Dichlorbenzene	106-46-7	< 0.06	< 0.01	400	yes
-	1,1-Dichlorethylene	75-35-4	< 0.06	< 0.01	35	yes
-	Dimethylformamide (DMF)	68-12-2	< 0.06	< 0.01	40	yes
12-1	Dioxane (1.4-)	123-91-1	< 0.06	< 0.01	1500	yes
-	Epichlorhydrin	106-89-8	< 0.06	< 0.01	1.5	yes
1-2	Ethylbenzene	100-41-4	< 0.06	< 0.01	1000	yes
6-2	Ethylene glycol (Ethandiol)	107-21-1	1.2	0.12	200	yes
6-14	2-Ethoxyethanol	110-80-5	< 0.06	< 0.01	35	yes
6-21	2-Ethoxyethyl acetate	111-15-9	< 0.06	< 0.01	150	yes
6-13	2-Methoxyethanol	109-86-4	< 0.06	< 0.01	30	yes
6-20	2-Methoxyethyl acetate	110-49-6	< 0.06	< 0.01	45	yes
7-22	Formaldehyde	50-00-0	0.12	0.01	9	yes

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/).

No	Compound Name	CAS-No.	SER_a 14d [µg/(u • h)]	Estimated Airborne Concentration in standard private office* (SERa 14d divided by 10.4 [m³/(u • h)]) [µg/m³]	Allowable Concentration in standard private office [µg/m³]	Requirement hold [yes/no]
2-2	n-Hexane	110-54-3	< 0.06	< 0.01	3500	yes
-	Isophorone	78-59-1	< 0.06	< 0.01	1000	yes
4-3	Isopropanol	67-63-0	< 0.06	< 0.01	3500	yes
-	Methyl chloroform	71-55-6	< 0.06	< 0.01	500	yes
-	Methylene chloride	75-09-2	< 0.06	< 0.01	200	yes
-	Methyl-t-butylether	1634-04-4	< 0.06	< 0.01	4000	yes
1-30	Naphthalene	91-20-3	< 0.06	< 0.01	4.5	yes
5-1	Phenol	108-95-2	0.24	0.02	100	yes
6-8	1-Methoxy-2-propanol	107-98-2	< 0.06	< 0.01	3500	yes
1-25	Styrene	100-42-5	< 0.06	< 0.01	450	yes
11-1	Tetrachlorethene	127-18-4	< 0.06	< 0.01	17.5	yes
1-1	Toluene	108-88-3	< 0.06	< 0.01	150	yes
-	Trichlorethene	79-01-6	< 0.06	< 0.01	300	yes
10-3	Vinyl acetate	108-05-4	< 0.06	< 0.01	100	yes
1-3	p- Xylene, m- Xylene, o- Xylene, (sum)	106-42-3, 108-38-3, 95-47-6	< 0.06	< 0.01	350	yes

*) Standard private office: Volume 30.6 m³, Floor surface 11.1 m², Air change rate 0.68 h-1
n.d. = not determinable (the limit of quantification is above the evaluation limit; therefore not evaluable)

Statement of conformity with the criteria of CA 01350 (standard school classroom)

The sample with the internal sample number 58762-A003 has been tested on behalf of **Hilti Entwicklungsgesellschaft mbH**. The article description according to the order is **Firestop Sleeve CFS-SL GA L.**

This evaluation bases on the test criteria of the „California Department of Public Health (CDPH) Standard Method v1.2–2017 (CA 01350)".

The VOC concentrations are calculated as Specific Emission Rate (SER_a). For the "Estimated Airborne Concentration in a standard school classroom" the SER_u is divided by an unit-specific flow rate of 47.4 m³/(u • h). This value was calculated specifically for this product in accordance with chapter 4.3.6 "IAQ Concentration Modelling – Modeling parameters for products not specifically addressed in data tables" and acc. to manufacturer's data as follows:

Firestop Sleeve CFS-SL GA L is used to create penetration gaps for cables. The product creates gaps on both sides of the wall, hence one product is assumed to count as 2 penetration gaps during testing.

• *Total number of gaps per room = 4 u*

Calculated area-specific flow rate: 0.82 h^{-1} / (4 u / 231 m³) = 47.4 m³/(u • h)

The results documented in the test report were evaluated as follows (acc. to Target CREL VOCs, CS01350, Table 4-1):[2]

No	Compound Name	CAS-No.	SER_u 14d [µg/(u • h)]	Estimated Airborne Concentration in standard school classroom* (SERa 14d divided by 47.4 [m³/(u • h)]) [µg/m³]	Allowable Concentration in standard school classroom [µg/m³]	Requirement hold [yes/no]
7-20	Acetaldehyde	75-07-0	< 0.06	< 0.01	70	yes
-	Benzene	71-43-2	< 0.06	< 0.01	1.5	yes
-	Carbon disulfide	75-15-0	< 0.06	< 0.01	400	yes
-	Carbon tetrachloride	56-23-5	< 0.06	< 0.01	20	yes
-	Chlorbenzene	108-90-7	< 0.06	< 0.01	500	yes
-	Chloroform	67-66-3	< 0.06	< 0.01	150	yes
-	1,4-Dichlorbenzene	106-46-7	< 0.06	< 0.01	400	yes
-	1,1-Dichlorethylene	75-35-4	< 0.06	< 0.01	35	yes
-	Dimethylformamide (DMF)	68-12-2	< 0.06	< 0.01	40	yes
12-1	Dioxane (1.4-)	123-91-1	< 0.06	< 0.01	1500	yes
-	Epichlorhydrin	106-89-8	< 0.06	< 0.01	1.5	yes
1-2	Ethylbenzene	100-41-4	< 0.06	< 0.01	1000	yes
6-2	Ethylene glycol (Ethandiol)	107-21-1	1.2	0.03	200	yes
6-14	2-Ethoxyethanol	110-80-5	< 0.06	< 0.01	35	yes
6-21	2-Ethoxyethyl acetate	111-15-9	< 0.06	< 0.01	150	yes
6-13	2-Methoxyethanol	109-86-4	< 0.06	< 0.01	30	yes
6-20	2-Methoxyethyl acetate	110-49-6	< 0.06	< 0.01	45	yes
7-22	Formaldehyde	50-00-0	0.12	< 0.01	9	yes

2 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/).

No	Compound Name	CAS-No.	SER_{14d} [µg/(u • h)]	Estimated Airborne Concentration in standard school classroom* (SERa 14d divided by 47.4 [m³/(u • h)]) [µg/m³]	Allowable Concentration in standard school classroom [µg/m³]	Requirement hold [yes/no]
2-2	n-Hexane	110-54-3	< 0.06	< 0.01	3500	yes
-	Isophorone	78-59-1	< 0.06	< 0.01	1000	yes
4-3	Isopropanol	67-63-0	< 0.06	< 0.01	3500	yes
-	Methyl chloroform	71-55-6	< 0.06	< 0.01	500	yes
-	Methylene chloride	75-09-2	< 0.06	< 0.01	200	yes
-	Methyl-t-butylether	1634-04-4	< 0.06	< 0.01	4000	yes
1-30	Naphthalene	91-20-3	< 0.06	< 0.01	4.5	yes
5-1	Phenol	108-95-2	0.24	< 0.01	100	yes
6-8	1-Methoxy-2-propanol	107-98-2	< 0.06	< 0.01	3500	yes
1-25	Styrene	100-42-5	< 0.06	< 0.01	450	yes
11-1	Tetrachlorethene	127-18-4	< 0.06	< 0.01	17.5	yes
1-1	Toluene	108-88-3	< 0.06	< 0.01	150	yes
-	Trichlorethene	79-01-6	< 0.06	< 0.01	300	yes
10-3	Vinyl acetate	108-05-4	< 0.06	< 0.01	100	yes
1-3	p- Xylene, m- Xylene, o- Xylene, (sum)	106-42-3, 108-38-3, 95-47-6	< 0.06	< 0.01	350	yes

*) Standard school classroom: Volume 231 m³, Floor surface 89.2 m², Air change rate 0.82 h-1
n.d. = not determinable (the limit of quantification is above the evaluation limit; therefore not evaluable)

Summary statement of conformity with the criteria of CA 01350

The sample with the internal sample number 58762-A003, article description according to order: **Firestop Sleeve CFS-SL GA L**, meets the emission requirements of the "Emission testing method for California Specification 01350 (02/2017)".

Cologne, 09/04/2024

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

A003, Preparation of test specimen

Date:	14/02/2024
Test specimen preparation:	not applicable
Masking of backside:	not applicable
Masking of edges:	no
Relationship of unmasked edges to surface:	not applicable
Loading reference unit:	unit-specific [u]
Dimensions:	41.5 cm x 17.0 cm; height: 17.0 cm

A003, Test chamber conditions according to DIN EN ISO 16000-9:2008-04

Chamber volume:	0.125 m³
Temperature:	23 °C ± 1 °C
Relative humidity:	50 % ± 1 %
Air pressure:	normal
Air:	cleaned
Air change rate:	1 h^{-1}
Air velocity:	0.3 m/s
Loading:	16 u/m³
Specific air flow rate:	0.0625 m³/(u·h)
Starting time of the test (t0):	14/02/2024
Air sampling:	11 days after test chamber loading 12 days after test chamber loading 14 days after test chamber loading

Analytics

Aldehydes and ketones	DIN ISO 16000-3:2013-01
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 A003, Volatile organic compounds after 11 days

Test objective:

Volatile organic compounds (VOC), test chamber, air sampling 11 days after test chamber loading

Test result:

Internal sample number: | 58762-A003

Total volatile organic compounds (Toluene equivalent DIN ISO 16000-6)	Concentration (test chamber air) [µg/m³]	SER_u [µg/(u • h)]
$TVOC_{11d}$	120	7.2

Substance	Concentration (test chamber air) [µg/m³]	SER_u [µg/(u • h)]
Formaldehyde	2	0.12

1.2 Sample A003, Volatile organic compounds after 12 days

Test objective:

Volatile organic compounds (VOC), test chamber, air sampling 12 days after test chamber loading

Test result:

Internal sample number: | 58762-A003

Total volatile organic compounds (Toluene equivalent DIN ISO 16000-6)	Concentration (test chamber air) [µg/m³]	SER_u [µg/(u • h)]
$TVOC_{12d}$	120	7.2

Substance	Concentration (test chamber air) [µg/m³]	SER_u [µg/(u • h)]
Formaldehyde	2	0.12

1.3 Sample A003, Volatile organic compounds after 14 days

Test objective:

Volatile organic compounds (VOC), test chamber, air sampling 14 days after test chamber loading

Test result:

Internal sample number:	58762-A003

No.	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]	CMR Classification++	½ CREL CDPH [µg/m³]	SER [µg/(u • h)]
4	**Aliphatic mono alcohols (n-, iso-, cyclo-) and dialcohols**							
4-6	1-Butanol	71-36-3	5.92	200	67			12
4-10	2-Ethyl-1-hexanol	104-76-7	14.06	4	< 5			0.24
5	**Aromatic alcohols**							
5-1	Phenol	108-95-2	12.85	4	< 5	Muta. 2	100	0.24
6	**Glycols, Glycol ethers, Glycol esters**							
6-2	Ethylene glycol (Ethane-1,2-diol)	107-21-1	6.32	20	< 5		200	1.2
7	**Aldehydes**							
7-22	Formaldehyde	50-00-0		2	n. d.	Carc. 1B Muta. 2	9	0.12
9	**Acids**							
9-1	Acetic acid	64-19-7	4.46	72	21			4.3
10	**Esters**							
10-11	n-Butyl acetate	123-86-4	9.04	2	< 5			0.12
10-15	n-Butyl acrylate	141-32-2	10.98	3	< 5	Group 3		0.18
10-16	2-Ethylhexyl acrylate	103-11-7	18.31	2	< 5	Group 2B		0.12

No.	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]	CMR Classifi-cation++	½ CREL CDPH [µg/m³]	SER [µg/(u • h)]
13	Other identified substances in addition to LCI list							
	Acetamide	60-35-5	7.59	3	< 5	Carc. 2		0.18
	m/z 47 73 89*		21.39	2	< 5			0.12

+ 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 14 days [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	< 0.06
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	< 0.06

TVOC, Total volatile organic compounds	Concentration after 14 days [µg/m³]	SER_u [µg/(u • h)]
Sum of VOC according to DIN EN 16516	88	5.3
Sum of VOC according to AgBB 2021	290	18
Sum of VOC according to eco-INSTITUT-Label	310	19
Sum of VOC according to DIN ISO 16000-6	120	7.2

TSVOC, Total semi volatile organic compounds	Concentration after 14 days [µg/m³]	SER_u [µg/(u • h)]
Sum of SVOC according to DIN EN 16516	< 5	< 0.3
Sum of SVOC without LCI according to AgBB 2021	< 5	< 0.3
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 0.06
Sum of SVOC with LCI according to AgBB 2021	< 5	< 0.3

TVVOC, Total very volatile organic compounds	Concentration after 14 days [µg/m³]	SER_u [µg/(u • h)]
Sum of VVOC according to AgBB 2021	< 5	< 0.3
Sum of VVOC according to eco-INSTITUT-Label	2	0.12

*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 14 days [µg/m³]	SER_u [µg/(u • h)]
VOC without LCI according to AgBB 2021 (sum)	< 5	< 0.3
VOC without LCI according to eco-INSTITUT-Label (sum)	5	0.3
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)	11	0.66
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV; Regulation (EC) No. 1272/2008: skin sensitising, respiratory sensitising; TRGS 907 (sum)	7	0.42
Bicyclic Terpenes (sum)	< 1	< 0.06
C9 - C14 Alkanes / Isoalkanes as dekane-equivalent (sum)	< 1	< 0.06
C4 - C11 Aldehydes, acyclic, aliphatic (sum)	< 2	< 0.12
C9 - C15 Alkylated benzenes (sum)	< 1	< 0.06
Cresols (sum)	< 1	< 0.06

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.26
R-value according to AgBB 2021	0.13
R-value according to Belgian regulation	0.08
R-value according to EU-LCI	0.09

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.

1.4 Carbon disulfide (CS_2, test chamber)

Test parameter:
Carbon disulfide (CS_2)

Test method:

Analytics:	DIN ISO 16000-6:2022-03

Test result:

Internal Sample number	Parameter	Measurement time (after test chamber loading)	Concentration (test chamber) [µg/m³]	Limit of quantification [µg/m³]
58762-A003	Carbon disulfide CS_2	14 days	< q.l.	1

< LOQ = Value below limit of quantification

Cologne, 09/04/2024

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

Appendix

Sampling sheet

eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

Chain of Custody Sheet

*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!

58762-003

Order by*	Hilti Entwicklungsgesellschaft mbH Hiltistraße 6 86916 Kaufering	**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 plant		**Sampling by*** (name, company, phone)	Supplier
X **Name of distribution** (if different from production)		**Sampling location***	Supplier
Name of test sample/ item*	CFS-SL GA	**Product type** (e.g. parquet, floor covering)	Firestop Speed Sleeve
Article number Model / Program / Series		**Sample/ Batch***	FL 300124
Plant name and location		**Production date of batch***	30.01.2024
Sample taken from	X current production storage other	**Sampling date***	30.01.2024
		Storage conditions before sampling	X 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) 30/01/2024

Signature Kretschmer Sarah

eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

Further informations on the assignment

Shipping details

Shipping date

Packed and shipped by

Carrier / Air bill no.

Invoice to
(if different from order)

Test report to
(if different from order)

Should the sample be tested on behalf of a product group / further product variants?

no
X yes, declaration of conformity enclosed

Quotation number
(if not available, please specify the aim of analysis)

Intended use of the product
(wall, floor ceiling etc.)

Further product informations
(Application quantity in g/m2, mixing ratio, possibly special features regarding the analysis etc.)

What should be done with the sample <u>after the end of the test</u>?

(if no information is given or the sample is not collected, the eco-INSTITUT Germany GmbH reserves the right to dispose of the sample after 3 months.)

The sample will be collected
The sample may be donated to third parties
X The sample should be destroyed and disposed

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

Date
(dd/mm/yyyy) 30/01/2024

Signature Kretschmer Sarah

For eco INSTITUT use only

Received by	Stephanie Müller	Received date	01.02.2024
Condition of shipping package		Condition of sample	
Lab tracking number	58762-003	Signature	

eco-INSTITUT Germany GmbH / Schanzenstrasse 6-20 / Carlswerk 1.19 / D-51063 Koln / 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: GENODED1EHH

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)[1,3]
Isobutenal (Methacrolein)[3]
2-Butenal[3]
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 16000-3:2013-01 (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: March 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.