eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

W.u.J. Derix GmbH & Co.
Dam 63
41372 Niederkrüchten

Test Report No. 55849-001-Bifma-L

Test objective:	**Emission test according to ANSI/BIFMA X7.1-2011 and the California Department of Public Health (CDPH) Standard Method v1.2–2017 (CA 01350)**
Name of test sample/item by client:	**100/5s**
Sample/batch by client:	**220-20LG008579**
Sampled by:	Sven Hattenrath, Poppensieker & Derix
Date of sampling:	12.11.2020
Location of sampling:	X-LAM Werk
Date of production:	04.11.2020
Date of arrival of sample:	23.11.2020
Test period:	23.11.2020 - 21.12.2020
Date of report:	07.01.2021
Number of pages of report:	24
Testing laboratory:	eco-INSTITUT Germany GmbH, Köln except ‡ subcontracted # outside accreditation
Test objective ANSI/ BIFMA X7.1-2011 fulfilled:	✓
Test objective CA 01350 fulfilled:	✓ standard school classroom X standard private office
Note:	The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report serves exclusively for submission to the awarding authority for the above-mentioned quality mark. The report is not permitted to be used in product and company advertising. More information at www.eco-institut.de/en/advertising

Content

Sample View

Internal sample-no. (will be filled in by laboratory)	Test sample/item by client	Sample/batch by client	Condition upon delivery	Type of sample
55849-A001	100/5s	220-20LG008579	without objection	CLT (cross laminated timber), Raw wood: spruce, Adhesive: PU

55849-A001

Statement of conformity with the criteria of ANSI/BIFMA and CA 01350

The sample with the internal sample no. 55849-A001 has been tested on behalf of **W.u.J. Derix GmbH & Co.**. The article description according to the customer is **100/5s.**

This evaluation bases on the test criteria of ANSI/BIFMA X7.1-2011 based on maximum emission factors for open plan office environment and private office environment.

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

Chemical Contaminant	Emission factor furniture after 168 h			ANSI/BIFMA X7.1 Open Plan Office Environment			Requirement hold [yes/no]
Emission analysis							
Measurement time: 7 days after test chamber loading							
Formaldehyde		9	µg/(m² • h)	≤	42.3	µg/(m² • h)	yes
TVOC		300	µg/(m² • h)	≤	345	µg/(m² • h)	yes
Total Aldehydes		1	µmol/(m² • h)	≤	2.8	µmol/(m² • h)	yes
4-Phenylcyclohexene	<	1	µg/(m² • h)	≤	4.5	µg/(m² • h)	yes

Chemical Contaminant	Emission factor furniture after 168 h			ANSI/BIFMA X7.1 Private Office Environment			Requirement hold [yes/no]
Emission analysis							
Measurement time: 7 days after test chamber loading							
Formaldehyde		9	µg/(m² • h)	≤	85.1	µg/(m² • h)	yes
TVOC		300	µg/(m² • h)	≤	694	µg/(m² • h)	yes
Total Aldehydes		1	µmol/(m² • h)	≤	5.7	µmol/(m² • h)	yes
4-Phenylcyclohexene	<	1	µg/(m² • h)	≤	9.0	µg/(m² • h)	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/).

CA 01350
For the "Estimated Airborne Concentration in a standard private office" the SERa is divided by area-specific flow rate of 0.62 m³/m²h for wall coverings in a standard private office (acc. to chapter 4.3 "IAQ Concentration Modelling").

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

No	Compound Name	CAS-No.	SERa 14d [µg/(m² • h)]	Estimated Airborne Concentration in standard private office* (SERa 14d divided by 0.62 [m/h]) [µg/m³]	Allowable Concentration in standard private office [µg/m³]	Requirement hold [yes/no]
1-1	Toluene	108-88-3	2	3.2	150	yes
1-2	Ethylbenzene	100-41-4	< 1	< 1.6	1000	yes
1-3	p- Xylene, m- Xylene, o- Xylene, (sum)	106-42-3, 108-38-3, 95-47-6	< 1	< 1.6	350	yes
1-25	Styrene	100-42-5	< 1	< 1.6	450	yes
1-30	Naphthalene	91-20-3	< 1	< 1.6	4.5	yes
2-2	n-Hexane	110-54-3	49	79	3500	yes
4-3	Isopropanol	67-63-0	< 1	< 1.6	3500	yes
5-1	Phenol	108-95-2	< 1	< 1.6	100	yes
6-2	Ethylene glycol (Ethandiol)	107-21-1	< 1	< 1.6	200	yes
6-8	1-Methoxy-2-propanol	107-98-2	< 1	< 1.6	3500	yes
6-13	2-Methoxyethanol	109-86-4	< 1	< 1.6	30	yes
6-14	2-Ethoxyethanol	110-80-5	< 1	< 1.6	35	yes
6-20	2-Methoxyethyl acetate	110-49-6	< 1	< 1.6	45	yes
6-21	2-Ethoxyethyl acetate	111-15-9	< 1	< 1.6	150	yes
7-20	Acetaldehyde	75-07-0	19	31	70	yes
7-22	Formaldehyde	50-00-0	10	16	9	**no**
10-3	Vinyl acetate	108-05-4	< 1	< 1.6	100	yes
11-1	Tetrachlorethene	127-18-4	< 1	< 1.6	17.5	yes
12-1	Dioxane (1.4-)	123-91-1	< 1	< 1.6	1500	yes
-	Benzene	71-43-2	< 1	< 1.6	1.5	n.d.
-	1,4-Dichlorbenzene	106-46-7	< 1	< 1.6	400	yes
-	Dimethylformamide (DMF)	68-12-2	< 1	< 1.6	40	yes
-	Isophorone	78-59-1	< 1	< 1.6	1000	yes
-	Trichlorethene	79-01-6	< 1	< 1.6	300	yes
-	Carbon tetrachloride	56-23-5	< 1	< 1.6	20	yes
-	Chlorbenzene	108-90-7	< 1	< 1.6	500	yes
-	Chloroform	67-66-3	< 1	< 1.6	150	yes
-	1,1-Dichlorethylene	75-35-4	< 1	< 1.6	35	yes
-	Epichlorhydrin	106-89-8	< 1	< 1.6	1.5	n.d.
-	Methyl chloroform	71-55-6	< 1	< 1.6	500	yes
-	Methylene chloride	75-09-2	< 1	< 1.6	200	yes
-	Methyl-t-butylether	1634-04-4	< 1	< 1.6	4000	yes
-	Carbon disulfide	75-15-0	< 1	< 1.6	400	yes

*) Standard private office: Volume 30.6 m³, net wall area 33.4 m², Air change rate 0.68 h-1

CA 01350

For the "Estimated Airborne Concentration in a standard school classroom" the SERa is divided by area-specific flow rate of 2.02 m³/m²h for wall coverings in a standard school classroom (acc. to chapter 4.3 "IAQ Concentration Modelling").

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

No	Compound Name	CAS-No.	SERa 14d [µg/(m² • h)]	Estimated Airborne Concentration in standard school classroom** (SERa 14d divided by 2.02 [m/h]) [µg/m³]	Allowable Concentration in standard private office [µg/m³]	Requirement hold [yes/no]
1-1	Toluene	108-88-3	2	1	150	yes
1-2	Ethylbenzene	100-41-4	< 1	< 0.5	1000	yes
1-3	p- Xylene, m- Xylene, o- Xylene, (sum)	106-42-3, 108-38-3, 95-47-6	< 1	< 0.5	350	yes
1-25	Styrene	100-42-5	< 1	< 0.5	450	yes
1-30	Naphthalene	91-20-3	< 1	< 0.5	4.5	yes
2-2	n-Hexane	110-54-3	49	24.3	3500	yes
4-3	Isopropanol	67-63-0	< 1	< 0.5	3500	yes
5-1	Phenol	108-95-2	< 1	< 0.5	100	yes
6-2	Ethylene glycol (Ethandiol)	107-21-1	< 1	< 0.5	200	yes
6-8	1-Methoxy-2-propanol	107-98-2	< 1	< 0.5	3500	yes
6-13	2-Methoxyethanol	109-86-4	< 1	< 0.5	30	yes
6-14	2-Ethoxyethanol	110-80-5	< 1	< 0.5	35	yes
6-20	2-Methoxyethyl acetate	110-49-6	< 1	< 0.5	45	yes
6-21	2-Ethoxyethyl acetate	111-15-9	< 1	< 0.5	150	yes
7-20	Acetaldehyde	75-07-0	19	9.4	70	yes
7-22	Formaldehyde	50-00-0	10	5	9	yes
10-3	Vinyl acetate	108-05-4	< 1	< 0.5	100	yes
11-1	Tetrachlorethene	127-18-4	< 1	< 0.5	17.5	yes
12-1	Dioxane (1.4-)	123-91-1	< 1	< 0.5	1500	yes
-	Benzene	71-43-2	< 1	< 0.5	1.5	yes
-	1,4-Dichlorbenzene	106-46-7	< 1	< 0.5	400	yes
-	Dimethylformamide (DMF)	68-12-2	< 1	< 0.5	40	yes
-	Isophorone	78-59-1	< 1	< 0.5	1000	yes
-	Trichlorethene	79-01-6	< 1	< 0.5	300	yes
-	Carbon tetrachloride	56-23-5	< 1	< 0.5	20	yes
-	Chlorbenzene	108-90-7	< 1	< 0.5	500	yes
-	Chloroform	67-66-3	< 1	< 0.5	150	yes
-	1,1-Dichlorethylene	75-35-4	< 1	< 0.5	35	yes
-	Epichlorhydrin	106-89-8	< 1	< 0.5	1.5	yes
-	Methyl chloroform	71-55-6	< 1	< 0.5	500	yes
-	Methylene chloride	75-09-2	< 1	< 0.5	200	yes
-	Methyl-t-butylether	1634-04-4	< 1	< 0.5	4000	yes
-	Carbon disulfide	75-15-0	< 1	< 0.5	400	yes

*) Standard school classroom: Volume 231 m³, net wall area 94.6m², Air change rate 0.82 h-1

Summary statement of conformity

The sample with the internal sample no 55849-A001, article description according to customer: **100/5s,** fulfills the emission requirements of ANSI/ BIFMA X7.1-2011.

The sample with the internal sample no 55849-A001, article description according to customer: **100/5s,** fulfills the emission requirements of the "Emission testing method for California Specification 01350 (02/2017)" for a standard school classroom.

The sample with the internal sample no 55849-A001, article description according to customer: **100/5s,** does not fulfill the emission requirements of the "Emission testing method for California Specification 01350 (02/2017)" for a standard private office.

Cologne, 07.01.2021

Daniel Tigges, Dipl.-Holzwirt
(Project Manager)

Laboratory report

1 Emission analysis

Test method

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

A001, Preparation of test sample

Date:	01.12.2020
Sample preparation:	not applicable
Masking of backside:	yes
Masking of edges:	yes, 100%
Relationship of unmasked edges to surface:	not applicable
Loading:	related to area
Dimensions:	62.5 cm x 40 cm [Thickness: 10 cm]

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

Chamber volume:	0.250 m³
Temperature:	23°C ± 1°C
Relative humidity:	50 % ± 1 %
Air pressure:	normal
Air:	cleaned
Air change rate:	1.0 h^{-1}
Air velocity:	0.3 m/s
Loading:	1.000 m²/m³
Specific air flow rate:	1 m³/(m² · h)
Air sampling:	3 days after test chamber loading 7 days after test chamber loading 14 days after test chamber loading

Analytics

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

1.1 Sample A001, Volatile Organic Compounds after 3 days

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

Test result:

Internal sample number:	55849-A001

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene-equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classification++	CREL CDPH [µg/m³]	SER µg/(m² • h)
1	**Aromatic hydrocarbons**							
1-1	Toluene	108-88-3	2.81	8	8	Repr. 2	150	8.00
1-16	1-Isopropyl-4-methylbenzene (p-cymene)	99-87-6	13.97	2				2.00
2	**Aliphatic hydrocarbons (n-, iso- and cyclo-)**							
2-1	3-Methylpentane	96-14-0	5.04	63	24			63.00
2-2	n-Hexane	110-54-3	5.16	130	78	Repr. 2	3500	130.00
2-3	Cyclohexane	110-82-7	6.31	8				8.00
3	**Terpenes**							
3-1	delta-3-Carene	498-15-7	13.7	29	24			29.00
3-2	alpha-Pinene	80-56-8	12.05	79	69			79.00
3-3	beta-Pinene	127-91-3	13.13	40	40			40.00
3-4	Limonene	138-86-3	14.12	34	35			34.00
3-5.5	Myrcene	123-35-3	12.95	3		Group 2B		3.00
3-5.6	Camphene	5794-03-6	12.5	5				5.00
4	**Aliphatic mono alcohols (n-, iso-, cyclo-) and dialcohols**							
4-7	Pentanol (all isomers)	71-41-0	8.06	1				1.00
6	**Glycols, Glycol ethers, Glycol esters**							
6-12	Dipropylene glycol monomethyl ether	34590-94-8	13.08	1				1.00

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene-equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classifi-cation++	CREL CDPH [µg/m³]	SER µg/(m² • h)
7	**Aldehydes**							
7-2	Pentanal	110-62-3	6.64	8				8.00
7-3	Hexanal	66-25-1	8.69	20	16			20.00
7-20	Acetaldehyde	75-07-0		25		Carc. 2	70	25.00
7-22	Formaldehyde	50-00-0		10		Carc. 1B Muta. 2	9	10.00
8	**Ketones**							
8-10	Acetone	67-64-1		31				31.00
9	**Acids**							
9-1	Acetic acid	64-19-7	4.91	53	25			53.00
9-7	n-Caproic acid (n-Hexanoic acid)	142-62-1	12.2	2				2.00
13	**Other identified substances in addition to LCI list**							
	Methylcyclopentane	96-37-7	5.71	56	41			56.00
	m/z 43 58*		4.16	4				4.00
	m/z 41 57 71*		4.84	20	20			20.00
	m/z 43 57 85*		6.14	1				1.00
	m/z 57 91 106*		10.46	1				1.00
	Terpene*		13.92	1				1.00
	Terpene*		14.22	5	5			5.00
	Terpene*		15.94	4	4			4.00
	Terpineol*		17.68	1				1.00

+ 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)

TVOC, Total volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to ISO 16000-6	380	380

Note:

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

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

1.2 Sample A001, Volatile Organic Compounds after 7 days

Test objective:
Volatile Organic Compounds (VOC), test chamber, air sampling 7 days after test chamber loading

Test result:

Internal sample number:	55849-A001

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene-equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classification++	CREL CDPH [µg/m³]	SER µg/(m² • h)
1	**Aromatic hydrocarbons**							
1-1	Toluene	108-88-3	8.17	5	5	Repr. 2	150	5.00
1-16	1-Isopropyl-4-methylbenzene (p-cymene)	99-87-6	13.93	2				2.00
2	**Aliphatic hydrocarbons (n-, iso- and cyclo-)**							
2-1	3-Methylpentane	96-14-0	5.04	37	11			37.00
2-2	n-Hexane	110-54-3	5.13	87	50	Repr. 2	3500	87.00
2-3	Cyclohexane	110-82-7	6.27	5				5.00
3	**Terpenes**							
3-1	delta-3-Carene	498-15-7	13.67	25	21			25.00
3-2	alpha-Pinene	80-56-8	12.01	74	66			74.00
3-3	beta-Pinene	127-91-3	13.08	36	36			36.00
3-4	Limonene	138-86-3	14.08	30	31			30.00
3-5.5	Myrcene	123-35-3	12.91	3		Group 2B		3.00
3-5.6	Camphene	5794-03-6	12.46	4				4.00
4	**Aliphatic mono alcohols (n-, iso-, cyclo-) and dialcohols**							
4-7	Pentanol (all isomers)	71-41-0	7.88	1				1.00
6	**Glycols, Glycol ethers, Glycol esters**							
6-12	Dipropylene glycol monomethyl ether	34590-94-8	13.04	1				1.00

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene-equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classification++	CREL CDPH [µg/m³]	SER µg/(m² • h)
7	**Aldehydes**							
7-2	Pentanal	110-62-3	6.61	6				6.00
7-3	Hexanal	66-25-1	8.66	16	13			16.00
7-20	Acetaldehyde	75-07-0		21		Carc. 2	70	21.00
7-22	Formaldehyde	50-00-0		9		Carc. 1B Muta. 2	9	9.00
8	**Ketones**							
8-10	Acetone	67-64-1		25				25.00
9	**Acids**							
9-1	Acetic acid	64-19-7	4.84	37	15			37.00
9-7	n-Caproic acid (n-Hexanoic acid)	142-62-1	12.16	2				2.00
13	**Other identified substances in addition to LCI list**							
	Methylcyclopentane	96-37-7	5.68	34	25			34.00
	m/z 43 58*		4.16	2				2.00
	m/z 41 57 71*		4.84	9	9			9.00
	Terpene*		14.22	4				4.00
	Terpene*		15.94	3				3.00
	Terpineol*		17.68	1				1.00

+ 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)

TVOC, Total volatile organic compounds	Concentration after 7 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to ISO 16000-6	300	300

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.

1.3 Sample A001, 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:	55849-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++	CREL CDPH [µg/m³]	SER µg/(m² • h)
1	**Aromatic hydrocarbons**							
1-1	Toluene	108-88-3	8.16	2		Repr. 2	150	2.00
1-16	1-Isopropyl-4-methylbenzene (p-cymene)	99-87-6	13.92	1				1.00
2	**Aliphatic hydrocarbons (n-, iso- and cyclo-)**							
2-1	3-Methylpentane	96-14-0	4.99	14	6			14.00
2-2	n-Hexane	110-54-3	5.11	49	28	Repr. 2	3500	49.00
2-3	Cyclohexane	110-82-7	6.26	3				3.00
3	**Terpenes**							
3-1	delta-3-Carene	498-15-7	13.65	21	17			21.00
3-2	alpha-Pinene	80-56-8	12	74	65			74.00
3-3	beta-Pinene	127-91-3	13.07	33	34			33.00
3-4	Limonene	138-86-3	14.06	25	26			25.00
3-5.5	Myrcene	123-35-3	12.9	2		Group 2B		2.00
3-5.6	Camphene	5794-03-6	12.45	4				4.00
7	**Aldehydes**							
7-2	Pentanal	110-62-3	6.6	5				5.00
7-3	Hexanal	66-25-1	8.65	13	10			13.00
7-20	Acetaldehyde	75-07-0		19		Carc. 2	70	19.00
7-22	Formaldehyde	50-00-0		10		Carc. 1B Muta. 2	9	10.00

No.	Substance	CAS No.	RT [min]	Concentration+ Substances ≥ 1 µg/m³ [µg/m³]	Toluene-equivalent Substances ≥ 5 µg/m³ [µg/m³]	CMR Classifi-cation++	CREL CDPH [µg/m³]	SER µg/(m² • h)
8	**Ketones**							
8-10	Acetone	67-64-1		18				18.00
9	**Acids**							
9-1	Acetic acid	64-19-7	4.82	33	16			33.00
9-7	n-Caproic acid (n-Hexanoic acid)	142-62-1	12.14	2				2.00
13	**Other identified substances in addition to LCI list**							
	Methylcyclopentane	96-37-7	5.67	20	14			20.00
	Alkan <C6		4.12	3				3.00
3-5	Other terpene hydrocarbons*	--	14.16	3				3.00
3-5	Other terpene hydrocarbons*	--	15.89	3				3.00

+ 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)

TVOC, Total volatile organic compounds	Concentration after 14 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to ISO 16000-6	**200**	**200**

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.

1.4 Carbon disulfide (CS_2, test chamber)

Test parameter:
Carbon disulfide (CS_2)

Test method:

Analytics:	DIN ISO 16000-6:2012-11
Limit of determination:	1 µg/m³

Test result:

Internal sample number:	55849-A001

Parameter	Measurement time [days]	Concentration (test chamber) [µg/m³]
Carbon disulfide CS_2	3	< q.l.
Carbon disulfide CS_2	7	< q.l.
Carbon disulfide CS_2	14	< q.l.

Cologne, 07.01.2021

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

Appendix

Sampling sheet

eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

Probenahmebegleitblatt

55849-001

*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 *	Poppensieker & Derix GmbH & Co. KG Industriestraße 24 D-49492 Westerkappeln	**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)	s.o.	**Probenehmer *** (Name, Firma, Telefon)	Sven Hattenrath Poppensieker & Derix +49 (0) 5456 9303-14
		Probenahmeort *	X-LAM Werk
Prüfstück-/Artikelbezeichnung *	100/5s	**Probeart** (z.B. Holzwerkstoff, Bodenbelag)	CLT (cross laminated timber) Rohholz: Fichte Klebstoff: PU
Artikel-Nr.		**Proben-/Chargen-Nr. ***	220-20LG008579
Modell / Programm / Serie		**Produktionsdatum der Charge *** (dd/mm/yyyy)	04.11.2020
Wo wurde die Probe vor Probenahme gelagert?	× Fertigung Lager Sonstiges	**Datum der Probenahme *** (dd/mm/yyyy)	12.11.2020
		Wie wurde das Produkt vor Probenahme gelagert?	× offen verpackt
Lagerort:	Die Probe wurde nach der Produktion entnommen und verpackt	**Verpackungsmaterial:**	Alufolie und Folie verschlossen

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): 18/11/2020

Unterschrift/Stempel: DERIX 18.11.2020 i.A. Sven Hattenrath

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
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)
Tributyl phosphate
N-Ethyl-2-pyrrolidone
Aniline
4-Vinylcyclohexene
Dichlormethane
Carbon tetrachloride
Chlorobenzene
Chloroform
Chloroprene (monomer)
Acetamide
Formamide
1,3-Dichlor-2-propanol
Cyclohexylisocyanate
Butyl methacrylate
2-Hexanone
Azobis[isobutyronitrile]
Benzophenone
1-Buthyl-2-pyrrolidone
Acroleine
Furfuryl alcohol
Decahydronaphthalene

1 VVOC
2 SVOC
3 Analyse gem. DIN ISO 16000 3:2013-01

Definition of terms

VOC (volatile organic compounds)	All individual compounds with a concentration ≥ 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.