

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

Test Report No. 55849-001-L

Test objective:	Emission analysis
Name of test sample/item by client:	100/5s
Sample/batch by client:	220-20LG008579
Product group:	
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:	19.02.2021
Number of pages of report:	24
Testing laboratory:	eco-INSTITUT Germany GmbH, Köln except ‡ subcontracted # outside accreditation

Note: The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report is not permitted to be used in product and company advertising. More information at www.eco-institut.de/en/advertising

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Sample View

Internal sample number (assigned by the laboratory)	Test sample/item by client	Sample/batch by client	Condition upon delivery	Type of sample
55849-A001	100/5s	220-20LG008579	without objection	CLT (cross laminated timber), Rohholz: Fichte, Klebstoff: PU



55849-A001

Laboratory report

1 Emission analysis

Test method

DIN EN 16516:2018-01

Testing and evaluation of the release of dangerous substances;
determination of emissions into indoor air

A001, Preparation of test sample

Date:

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 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 Classifi- cation++	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
7	Aldehyde							
7-2	Pentanal	110-62-3	6.64	8				8,00

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)
7-3	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: Kategorie III1 and III2

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

Carcinogenic, mutagenic and reproductive toxic components*	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1	< 1
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 1

TVOC, Total volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VOC according to DIN EN 16516	360	360
Sum of VOC according to AgBB 2018 / DIBt	480	480
Sum of VOC according to eco-INSTITUT-Label	510	510
Sum of VOC according to ISO 16000-6	380	380

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	< 5
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 5
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 1
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 5

TVVOC, Total very volatile organic compounds	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	130	130
Sum of VVOC according to eco-INSTITUT-Label	130	130

*Excluding formaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). In the case of a toxicological emission assessment, a single-substance analysis of the formaldehyde concentration is necessary. In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

Other sums of VOC	Concentration after 3 days [µg/m³]	SERa [µg/(m² · h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	81	81
VOC without LCI according to eco-INSTITUT-Label (Sum)	89	89
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	180	180
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	200	200
Bicyclic Terpenes (sum)	150	150
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 1
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	28	28
C9 - C15 Alkylated benzenes (Sum)	2	2
Cresols (Sum)	< 1	< 1

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.35
R-value according to AgBB 2018 / DIBt	0.35
R-value according to Belgian regulation	0.35
R-value according to AFSSET	1.89

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 Classifi- cation++	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
7	Aldehyde							
7-2	Pentanal	110-62-3	6.61	6				6,00

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)
7-3	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: Kategorie III1 and III2

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

Carcinogenic, mutagenic and reproductive toxic components*	Concentration after 7 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	< 1
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 1

TVOC, Total volatile organic compounds	Concentration after 7 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VOC according to DIN EN 16516	270	270
Sum of VOC according to AgBB 2018 / DIBt	360	360
Sum of VOC according to eco-INSTITUT-Label	390	390
Sum of VOC according to ISO 16000-6	300	300

TSVOC, Total semi volatile organic compounds	Concentration after 7 days [µg/m³]	SERa [µg/(m² · h)]
Sum of SVOC according to DIN EN 16516	< 5	< 5
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 5
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 1
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 5

TVVOC, Total very volatile organic compounds	Concentration after 7 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	92	92
Sum of VVOC according to eco-INSTITUT-Label	94	94

*Excluding formaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). In the case of a toxicological emission assessment, a single-substance analysis of the formaldehyde concentration is necessary. In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

Other sums of VOC	Concentration after 7 days [µg/m³]	SERa [µg/(m² · h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	43	43
VOC without LCI according to eco-INSTITUT-Label (Sum)	51	51
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	130	130
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	180	180
Bicyclic Terpenes (Sum)	140	140
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 1
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	22	22
C9 - C15 Alkylated benzenes (Sum)	2	2
Cresols (Sum)	< 1	< 1

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.29
R-value according to AgBB 2018 / DIBt	0.29
R-value according to Belgian regulation	0.29
R-value according to AFSSET	1.60

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	Aldehyde							
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: Kategorie III1 and III2

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

Carcinogenic, mutagenic and reproductive toxic components*	Concentration after 14 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	< 1
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 1

TVOC, Total volatile organic compounds	Concentration after 14 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VOC according to DIN EN 16516	210	210
Sum of VOC according to AgBB 2018 / DIBt	270	270
Sum of VOC according to eco-INSTITUT-Label	290	290
Sum of VOC according to ISO 16000-6	200	200

TSVOC, Total semi volatile organic compounds	Concentration after 14 days [µg/m³]	SERa [µg/(m² · h)]
Sum of SVOC according to DIN EN 16516	< 5	< 5
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 5
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 1
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 5

TVVOC, Total very volatile organic compounds	Concentration after 14 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	61	61
Sum of VVOC according to eco-INSTITUT-Label	64	64

*Excluding formaldehyde (Carc. 1B) due to an assumed "practical threshold" under which a significant carcinogenic risk is no longer to be expected (see Federal Institute for Risk Assessment (2006): Toxicological evaluation of formaldehyde and Federal Environment Agency (2016): Reference value for formaldehyde in indoor air). In the case of a toxicological emission assessment, a single-substance analysis of the formaldehyde concentration is necessary. In the opinion of the committee for Indoor Air Guide Values (Ausschuss für Innenraumrichtwerte) of the Federal Environment Agency, the concentration of 0.1 mg formaldehyde/m³ indoor air, based on a measurement period of half an hour, should not be exceeded, also for a short time (Bundesgesundheitsblatt 2016 · 59: 1040-1044 DOI 10.1007 / s00103 -016-2389-5 © Springer-Verlag Berlin Heidelberg 2016).

Other sums of VOC	Concentration after 14 days [µg/m³]	SERa [µg/(m² · h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	20	20
VOC without LCI according to eco-INSTITUT-Label (Sum)	20	20
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	82	82
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	170	170
Bicyclic Terpenes (Sum)	130	130
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 1
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	18	18
C9 - C15 Alkylated benzenes (Sum)	1	1
Cresols (Sum)	< 1	< 1

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.27
R-value according to AgBB 2018 / DIBt	0.26
R-value according to Belgian regulation	0.26
R-value according to AFSSET	1.58

Note:

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

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

1.4 Carbon disulfide (CS₂, test chamber)

Test parameter:

Carbon disulfide (CS₂)

Test method:

Analytics:	DIN ISO 16000-6:2012-11
Limit of determination:	1 µg/m ³

Test result:

Internal sample number:	55849-A001
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Parameter	Measurement time [days]	Concentration (test chamber) [µg/m ³]
Carbon disulfide CS ₂	3	< q.l.
Carbon disulfide CS ₂	7	< q.l.
Carbon disulfide CS ₂	14	< q.l.

< q.l. = Value below quantification limit

Cologne, 19.02.2021



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

Appendix

Sampling sheet




Probenahmebegleitblatt

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!

55849-001

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 s.o. Name des Händlers (wenn abweichend vom Auftraggeber)		Probenehmer * Sven Hattenrath (Name, Firma, Telefon) Poppensieker & Derix +49 (0) 5456 9303-14	
		Probenahmeort * X-LAM Werk	
Prüfstück- / Artikelbezeichnung * 100/5s Artikel-Nr. Modell / Programm / Serie		Probeart (z.B. Holzwerkstoff, Bodenbelag) CLT (cross laminated timber) Rohholz: Fichte Klebstoff: PU Proben-/Chargen-Nr. * 220-20LG008579 Produktionsdatum der Charge * 04.11.2020 (dd/mm/yyyy)	
Wo wurde die Probe vor Probenahme gelagert? <input checked="" type="checkbox"/> Fertigung <input type="checkbox"/> Lager <input type="checkbox"/> Sonstiges		Datum der Probenahme * 12.11.2020 (dd/mm/yyyy)	
		Wie wurde das Produkt vor Probenahme gelagert? <input checked="" type="checkbox"/> offen <input type="checkbox"/> 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:  18.11.2020 I.A. Sven Hattenrath	

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 Fax +49 221 931245-33 / eco-institut.de / eco-institut-label.de / Geschäftsführer: Dr. Frank Kuebart, Daniel Tigges
 HRB 17917 / USt-ID: DE 122653308 / Volksbank Rhein-Erft-Köln eG, IBAN: DE60370623651701900010, BIC: GENODE33HAN

List of calibrated Volatile Organic Compounds (VOC)

Aromatic hydrocarbons

Toluene
 Ethylbenzene
 p-Xylene
 m-Xylene
 o-Xylene
 Isopropylbenzene
 n-Propylbenzene
 1,3,5-Trimethylbenzene
 1,2,4-Trimethylbenzene
 1,2,3-Trimethylbenzene
 2-Ethyltoluene
 1-Isopropyl-2-methylbenzene
 1-Isopropyl-4-methylbenzene
 1,2,4,5-Tetramethylbenzene
 n-Butylbenzene
 1,3-Diisopropylbenzene
 1,4-Diisopropylbenzene
 Phenyltoluene
 1-Phenyldecane²
 1-Phenylundecane²
 4-Phenylcyclohexene
 Styrene
 β-Methylstyrene
 Phenylacetylene
 2-Phenylpropene
 Vinyltoluene
 Naphthalene
 Indene
 Benzene
 1-Methylnaphthalene
 2-Methylnaphthalene
 1,4-Dimethylnaphthalene

Saturated aliphatic substances

2-Methylpentane¹
 3-Methylpentane¹
 n-Hexane
 Cyclohexane
 Methylcyclohexane
 n-Heptane
 n-Octane
 n-Nonane
 n-Decane
 n-Undecane
 n-Dodecane
 n-Tridecane
 n-Tetradecane
 n-Pentadecane
 n-Hexadecane
 Methylcyclopentane
 1,4-Dimethylcyclohexane
 2,2,4,6,6-Pentamethylheptane

Terpenes

delta-3-Carene
 alpha-Pinene
 beta-Pinene
 Limonene
 (iso)Longifolene
 beta-Caryophyllene

alpha-Phellandrene
 Myrcene
 Camphene
 alpha-Terpinene
 Longipinene

Aliphatic alcohols and ether

1-Propanol¹
 2-Propanol¹
 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
 Ethanol¹

Aromatic alcohols (phenoles)

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

Glycols, Glycol ether, Glycol ester

Propyleneglycol (1,2-Dihydroxypropane)
 Ethyleneglycol (Ethandiol)
 Ethylene glycol monobutyl ether
 Diethylene glycol
 Diethylene glycol-monobutyl ether
 2-Phenoxyethanol
 Ethylene carbonate
 1-Methoxy-2-propanol
 2-Methoxy-1-propanol
 2-Methoxy-1-propyl acetate
 Texanol
 Glycolic acid butylester
 Butyl diglycol acetate
 Dipropylene glycol monomethyl ether
 2-Methoxyethanol
 2-Ethoxyethanol
 2-Propoxyethanol
 2-Methylethoxyethanol
 2-Hexoxyethanol
 1,2-Dimethoxyethane
 1,2-Diethoxyethane
 2-Methoxyethyl acetate
 2-Ethoxyethyl acetate
 2-(2-Hexoxyethoxy)ethanol
 1-Methoxy-2-(2-methoxy-ethoxy)ethane
 Propylene glycol diacetate
 Dipropylene glycol
 Dipropylene glycol monomethylether acetate
 Dipropylene glycol n-butylether
 Dipropylene glycol n-propyl ether

Di(propylene glycol) tert-butylether
 1,4-Butanediol
 Tri(propylene glycol) methyl ether
 Triethylene glycol dimethyl ether
 Propylene glycol dimethyl ether
 TXIB (Texanol isobutyrate)
 Ethyldiglycol
 Dipropylene glycol dimethylether
 Propylene carbonate
 Hexyleneglycol
 3-Methoxy-1-butanol
 Propylene glycol n-propyl ether
 Propylene glycol n-butyl ether
 Diethylene glycol phenyl ether
 Neopentyl glycol
 Diethylene glycol methyl ether
 1-Ethoxy-2-propanol
 tert-Butoxy-2-propanol
 2-Butoxy ethyl acetate

Aldehydes

Butanal^{1,3}
 3-Methyl-1-butanol
 Pentanal
 Hexanal
 Heptanal
 2-Ethylhexanal
 Octanal
 Nonanal
 Decanal
 2-Butenal³
 2-Pentenal³
 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}
 Isobutenal³

Ketones

Ethylmethylketone³
 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

Methylacetate¹
 Ethyl acetate¹
 Vinyl acetate¹
 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
 Diethylphthalate²
 Dipropylphthalate²
 Dibutylphthalate²
 Diisobutylphthalate²
 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
 Tetradecamethylcycloheptasiloxane
 Tetrahydrofuran (THF)
 1-Octene
 1-Decene
 1-Dodecene
 2-Pentylfuran
 2-Methylfuran
 Isophorone
 Tetramethyl succinonitrile
 Dimethylformamide (DMF)
 N-Ethyl-2-pyrrolidone
 Aniline
 4-Vinylcyclohexene
 Dichlormethane
 Carbon tetrachloride
 Chlorobenzene
 Chloroform
 Chloroprene (monomer)
 Acetamide
 Formamide
 1,3-Dichlor-2-propanol
 Cyclohexylisocyanate
 Butyl methacrylate
 2-Hexanone
 Azobis[isobutyronitrile]
 Benzophenone
 1-Buthyl-2-pyrrolidone
 Acroleine
 Furfuryl alcohol
 Decahydronaphthalene
 Benzothiazole

1 VVOC

2 SVOC

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

Definition of terms

VOC (volatile organic compounds)	All individual compounds with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range C_6 (n-Hexane) to C_{16} (n-Hexadecane)
TVOC	Total volatile organic compounds
TVOC according to DIN EN 16516:2018-01	Sum of all VOC $\geq 5 \mu\text{g}/\text{m}^3$ in the retention range C_6 to C_{16} , calculated as toluene equivalent
TVOC according to AgBB/DIBt	Sum of all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$, SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI and not calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ calculated as toluene equivalent
TVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$, SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI and not calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ calculated as toluene equivalent
TVOC according to ISO 16000-6:2012-11	Total area of chromatogram in the retention range C_6 to C_{16} , calculated as toluene equivalent
TVOC without LCI according to AgBB/DIBt and Belgian regulation	Sum of all VOC without NIK $\geq 5 \mu\text{g}/\text{m}^3$ in the retention range C_6 to C_{16}
TVOC without LCI according to eco-INSTITUT-Label	Sum of all VOC without NIK $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range C_6 to C_{16}
CMR-VOC (carcinogenic, mutagenic, reproduction-toxic VOC, VVOC and SVOC)	All individual substances with the following categories: Regulation (EC) No. 1272/2008: Category Car.1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B IARC: Group 1 and 2A DFG (MAK lists): Category III1 and III2
VVOC (very volatile organic compounds)	All individual substances with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range $< C_6$
TVVOC	Total very volatile organic compounds
TVVOC according to AgBB/DIBt and Belgian regulation	Sum of all identified and calibrated VVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI
TVVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VVOC $\geq 1 \mu\text{g}/\text{m}^3$ with LCI
SVOC (semi volatile organic compounds)	All individual substances $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range C_{16} to C_{22}
TSVOC	Total semi volatile organic compounds
TSVOC according to DIN EN 16516:2018-01	Sum of all SVOC in the retention range C_{16} to C_{22} , calculated as toluene equivalent
TSVOC without LCI according to AgBB/DIBt	Sum of all SVOC $\geq 5 \mu\text{g}/\text{m}^3$ without LCI
TSVOC without LCI according to eco-INSTITUT-Label	Sum of all SVOC $\geq 1 \mu\text{g}/\text{m}^3$ without LCI
TSVOC with LCI according to AgBB/DIBt	Sum of all identified and calibrated SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI
SER	Specific emission rate (see "Explanation of Specific Emission Rate SER")
LCI value	Lowest Concentration of Interest; calculated value for the evaluation of VOC, established by the Committee for Health-related Evaluation of Building Products (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten - AgBB)

R value	The quotient of the concentration and the LCI value is generated for every substance which is detected in the test chamber air. The sum of the calculated quotients results in the R value.
R value according to eco-INSTITUT-Label	R value for all identified and calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2018
R value according to AgBB 2018/DIBt	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2018
R value according to Belgian regulation	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the Belgian regulation
R value according to AFSSET	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by ANSES (French National Agency on Food Safety, Environment, and Workplace Security)
RT (retention time)	Time for a particular analyte to pass through the system (from the column inlet to the detector)
CAS No. (Chemical Abstracts Service)	International unique numerical identifier for a chemical substance
Toluene equivalent	Concentration, calculated as toluene equivalent

Commentary on emission analysis

Test method

Measurement of the volatile organic compounds takes place in the test chamber in conditions similar to those applying in practice. Standardized test conditions are defined for the test chamber regarding loading, air exchange, relative humidity, temperature and incoming air, based on the type of test specimen and the required guideline. These conditions and the underlying standards are to be found in the section on test methods in the laboratory report.

Air samples are taken from the test chamber at defined points in time during the continuously running test. To this end, approximately 5 L of air are collected from the test chamber with an air flow rate of 100 mL/min for Tenax and approx. 100 L with an air flow rate of 0.8 L/min for DNPH (dinitrophenylhydrazine).

After thermal desorption, the substances adsorbed on Tenax are analysed using gas chromatographic separation and mass spectrometric determination. The gas chromatographic separation is performed with a slightly polar capillary column of 60 m in length.

The substances derivatized with DNPH for the determination of formaldehyde and other short-chain carbonyl compounds (C1 - C6) are analysed using high-performance liquid chromatography.

Over 200 compounds, including volatile organic compounds (C6 - C16), semi-volatile organic compounds (C16 - C22) and – insofar as possible with this method – also very volatile organic compounds (less than C6) are determined and quantified individually from 1 µg/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 signal of the standard d8 toluene. The identification and quantification of substances is carried out, as far as technically feasible, from a concentration (evaluation limit) of 5 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.