eco-INSTITUT Germany GmbH
Laborprüfung
Laboratory testing

Ind. & Handelmij Rivièra B.V.
Nijverheidsweg 16
1271 EA HUIZEN
Netherlands

Test Report No. 57224-A001-QUL-L

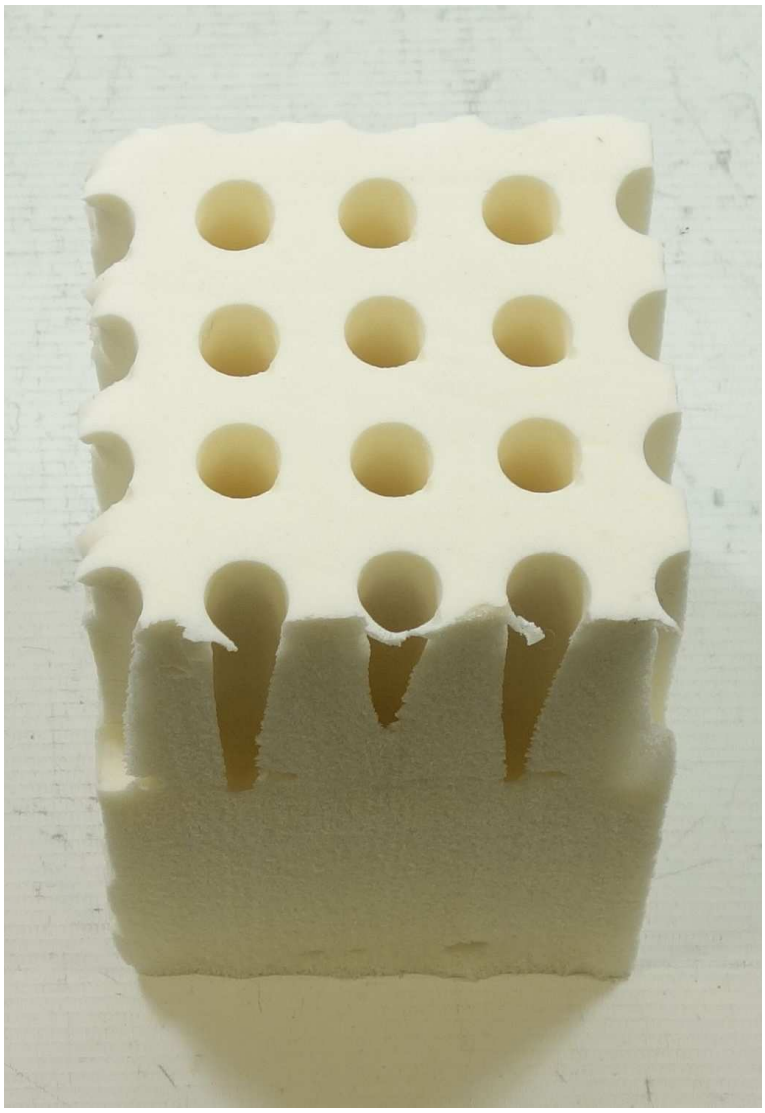
Test objective:	**Evaluation according to QUL criteria**
Name of test sample/item by client:	**G5 - I5 med**
Sample/batch by client:	**22 10 24**
Sampled by:	
Date of sampling:	08/03/2022
Location of sampling:	Huizen
Date of production:	07/03/2022
Date of arrival of sample:	17/03/2022
Processing period:	17/03/2022 - 11/04/2022
Date of report:	12/04/2022
Number of pages of report:	27
Testing laboratory:	eco-INSTITUT Germany GmbH, Köln
Test objective fulfilled:	✓
Note:	The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report 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 (assigned by the laboratory)	Test sample / item by client	Sample/batch number by client	Condition upon delivery	Type of sample
57224-A001	G5 - I5 med	22 10 24	without objection	Heavier Foam 100% NR



57224-A001

Statement of conformity with QUL criteria

The sample with the internal sample no. 57224-A001 was submitted to laboratory tests on behalf of **Ind. & Handelmij Rivièra B.V.** for an ecological product examination according to the QUL test criteria (Qualitätsverband umweltverträglicher Latexmatratzen e.V.). The article description according to the customer is **G5 - I5 med.**
The results documented in the test report were evaluated as follows.[1]

Test parameters	Result		Limit Value		Within limits [yes/no]
Emission analysis					
Measurement time: 2 days after test chamber loading					
TVOC (total volatile organic compounds)	250	µg/m³	≤	400 µg/m³	yes
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	µg/m³	≤	1 µg/m³	yes
Formaldehyde	3	µg/m³	≤	24 µg/m³	yes
Acetaldehyde	< 2	µg/m³	≤	24 µg/m³	yes
Measurement time: 7 days after test chamber loading					
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	µg/m³	≤	1 µg/m³	yes
CMR 2: CMR: 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)	4	µg/m³	≤	50 µg/m³	yes
TVOC (total volatile organic compounds including SVOC with LCI)	120	µg/m³	≤	200 µg/m³	yes
TSVOC (total semi-volatile organic compounds)	< 1	µg/m³	≤	40 µg/m³	yes
VOC (Sum) without LCI	73	µg/m³	≤	100 µg/m³	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/).

Test parameters	Result		Limit Value		Within limits [yes/no]
Emission analysis					
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV; Regulation (EC) No. 1272/2008: skin sensitising, respiratory sensitising; TRGS 907 (Sum)	3	µg/m³	≤ 100	µg/m³	yes
Bicyclic terpenes (Sum)	< 1	µg/m³	≤ 200	µg/m³	yes
C9 – C14 Alkanes / Isoalkanes (Sum)	< 1	µg/m³	≤ 200	µg/m³	yes
C4 – C11 Aldehydes, acyclic, aliphatic (Sum)	< 2	µg/m³	≤ 100	µg/m³	yes
C6 – C15 Alkyl benzenes (Sum)	1	µg/m³	≤ 100	µg/m³	yes
Cresols (Sum)	< 1	µg/m³	≤ 5	µg/m³	yes
Xylene (Sum)	< 1	µg/m³	≤ 100	µg/m³	yes
VOC (individual substances):					
Ethyl acetate (VVOC)	< 1	µg/m³	≤ 600	µg/m³	yes
Phenol	< 1	µg/m³	≤ 20	µg/m³	yes
Methylisothiazolinone (MIT)	< 1	µg/m³	≤ 1	µg/m³	yes
Octylisothiazolinone (OIT)	< 1	µg/m³	≤ 1	µg/m³	yes
Benzaldehyde	< 1	µg/m³	≤ 20	µg/m³	yes
2-Ethyl-1-hexanol	< 1	µg/m³	≤ 100	µg/m³	yes
Ethylen glycol monobutylether	2	µg/m³	≤ 100	µg/m³	yes
2-Hexoxyethanol	< 1	µg/m³	≤ 100	µg/m³	yes
Benzothiazole [1)]	12	µg/m³	≤ 15	µg/m³	yes
2-Butoxyethyl acetate	< 1	µg/m³	≤ 200	µg/m³	yes
2-Phenoxyethanol	< 1	µg/m³	≤ 30	µg/m³	yes
Propylene glycol (Propane-1,2-diol)	< 1	µg/m³	≤ 60	µg/m³	yes
R-Value	0.09		≤ 1.0		yes

1) preliminary, exceeding the limit does not lead to devaluation at present

Test parameter	Sample	Result	Limit value	Within limits [yes/no]
Further Emission and Content analyses				
Carbon Disulphide (only latex products)	57224-A001	2 µg/m³	≤ 50 µg/m³	yes
Nitrosamines (only latex products)	57224-A001	0.045 µg/m³	≤ 0.1 µg/m³	yes
Filler content	57224-A001	0.0 %	≤ 5 %	yes
Polymer content (NR: natural rubber)	57224-A001	100 % NR	not applicable	not applicable
Odour	57224-A001	Grade 2.9	≤ Grade 3 (2 days after test chamber loading)	yes

Cologne, 12/04/2022

Vanessa Laumann, Dipl.-Chem.
(Project Manager)

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

A001, Preparation of test sample

Date:	28/03/2022
Sample preparation:	not applicable
Masking of backside:	no
Masking of edges:	no
Relationship of unmasked edges to surface:	not applicable
Loading:	related to area
Dimensions:	10.1 cm x 10.1 cm x 15 cm

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

Chamber volume:	0.125 m^3
Temperature:	23 °C ± 1 °C
Relative humidity:	50 % ± 1 %
Air pressure:	normal
Air:	cleaned
Air change rate:	0.5 h^{-1}
Air velocity:	0.3 m/s
Loading:	0.65 m^2/m^3
Specific air flow rate:	0.769 $m^3/(m^2 \cdot h)$
Starting time of the test (t0):	28/03/2022
Air sampling:	2 days after test chamber loading 7 days after test chamber loading

Analytics

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

1.1 Sample A001, Volatile Organic Compounds after 2 days

Test objective:
Volatile Organic Compounds (VOC), test chamber, air sampling 2 days after test chamber loading

Test result:

Internal sample number:	57224-A001

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++	LCI AgBB 2021 [µg/m³]	R-value
1	**Aromatic hydrocarbons**							
1-16	1-Isopropyl-4-methylbenzene (p-Cymene)	99-87-6	13.67	5	< 5		1000	0.01
3	**Terpenes**							
3-4	Limonene	138-86-3	13.8	5	5		5000	0.00
3-5.1	Longifolene	475-20-7	22.66	2	< 5		1400	0.00
5	**Aromatic alcohols**							
5-2	BHT (2,6-di-tert-butyl-4-methylphenol)	128-37-0	23.7	5	< 5	Group 3	100	0.05
7	**Aldehydes**							
7-22	Formaldehyde	50-00-0		3	n. d.	Carc. 1B Muta. 2	100	0.03
13	**Other identified substances in addition to LCI list**							
	Benzothiazole	95-16-9	18.45	16	11			
	trans-Decahydronaphthalene	493-02-7	14.76	2	< 5			
	cis-Decahydronaphthalene	493-01-6	15.76	1	< 5			
	m/z 56 42 71*		4.39	3	< 5			
	presum. Diethylamine m/z 58 44 73*		4.66	110	110			
	ver. Diethylmethylamine m/z 44 72 58*		5.123	2	< 5			
	m/zh 73 104 119*		9.28	1	< 5			
	Diethylformamide m/z 58 44 101*		11.46	10	10			
	m/Z 43 57 58*		12.86	1	< 5			
2-10	Cluster isoalkanes, alkenes and/or other alcohols*	--	12.96	7	7		6000	0.00

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++	LCI AgBB 2021 [µg/m³]	R-value
2-10	Cluster isoalkanes, alkenes and/or other alcohols*	--	13.15	11	11		6000	0.00
	m/z 57 97 69*		13.57	1	< 5			
	m/z 97 55 57*		13.9	1	< 5			
3-5	Other terpenes*	--	14.37	3	< 5		1400	0.00
2-10	Cluster isoalkanes, alkenes and/or other alcohols*	--	14.48	1	< 5		6000	0.00
	several not identified substances*		14.88-15.1	5	5			
1-29	Other not identified alkylbenzenes*	--	15.14	18	18		450	0.04
	m/z 44 117 56*		16.66	3	< 5			
2-10	Cluster isoalkanes, alkenes and/or other alcohols*	--	18.53-20.75	40	40		6000	0.01
	Sesquiterpen*		21.78	2	< 5			

+ identified and calibrated substances, substance specific calculated

++ Classification according to Regulation (EG) N° 1272/2008: Categories Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B, TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A, DFG MAK-list: Categorie III1 and III2

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

Carcinogenic, mutagenic and reproductive toxic components*	Concentration after 2 days [µg/m³]	SERa [µg/(m² • h)]
CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (sum)	< 1	< 0.77
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	< 0.77

TVOC, Total volatile organic compounds	Concentration after 2 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to DIN EN 16516	220	170
Sum of VOC according to AgBB 2021	230	170
Sum of VOC according to eco-INSTITUT-Label	250	190
Sum of VOC according to ISO 16000-6	200	150

TSVOC, Total semi volatile organic compounds	Concentration after 2 days [µg/m³]	SERa [µg/(m² • h)]
Sum of SVOC according to DIN EN 16516	< 5	< 3.9
Sum of SVOC without LCI according to AgBB 2021	< 5	< 3.9
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 0.77
Sum of SVOC with LCI according to AgBB 2021	< 5	< 3.9

TVVOC, Total very volatile organic compounds	Concentration after 2 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VVOC according to AgBB 2021	< 5	< 3.9
Sum of VVOC according to eco-INSTITUT-Label	6	4.6

*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 2 days [µg/m³]	SERa [µg/(m² • h)]
VOC without LCI according to AgBB 2021 (sum)	140	110
VOC without LCI according to eco-INSTITUT-Label (sum)	160	120
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)	3	2.3
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV; Regulation (EC) No. 1272/2008: skin sensitising, respiratory sensitising; TRGS 907 (sum)	10	7.7
Bicyclic Terpenes (sum)	2	1.5
C9 - C14 Alkanes / Isoalkanes as dekane-equivalent (sum)	< 1	< 0.77
C4 - C11 Aldehydes, acyclic, aliphatic (sum)	< 2	< 1.5
C9 - C15 Alkylated benzenes (sum)	5	3.9
Kresoles (sum)	< 1	< 0.77

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.14
R-value according to AgBB 2021	0.11
R-value according to Belgian regulation	0.11
R-value according to EU-LCI	0.06

Note:

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

Short-chain carbonyl compounds (C1-C5) are quantified via HPLC acc. to DIN ISO 16000-3:2013-01. Therefore, no toluene equivalents are given for VVOC. These substances are taken into concern by means of their substance specific calibration via the sum of VVOC acc. to DIN EN 16516:2020-10. For VOC however, the substance specific calibration takes place via HPLC whereas the TVOC is calculated using the toluene equivalent determined via Tenax acc. to DIN EN 16516:2020-10.

1.2 Sample 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:	57224-A001

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++	LCI AgBB 2021 [µg/m³]	R-value
1	**Aromatic hydrocarbons**							
1-16	1-Isopropyl-4-methylbenzene (p-Cymene)	99-87-6	13.67	1	< 5		1000	0.00
3	**Terpenes**							
3-4	Limonene	138-86-3	13.8	1	< 5		5000	0.00
5	**Aromatic alcohols**							
5-2	BHT (2,6-di-tert-butyl-4-methylphenol)	128-37-0	23.69	4	< 5	Group 3	100	0.04
6	**Glycols, Glycol ethers, Glycol esters**							
6-3	Ethylene glycol monobutyl ether (2-Butoxyethanol)	111-76-2	10.81	2	< 5	Group 3	1600	0.00
7	**Aldehydes**							
7-20	Acetaldehyde	75-07-0		2	n. d.	Carc. 1B Muta. 2	300	0.01
7-22	Formaldehyde	50-00-0		2	n. d.	Carc. 1B Muta. 2	100	0.02

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++	LCI AgBB 2021 [µg/m³]	R-value
13	**Other identified substances in addition to LCI list**							
	Benzothiazole	95-16-9	18.43	12	8			
	m/z 56 42 71*		4.39	3	< 5			
	presu.. Diethylamine m/z 58 44 73*		4.66	54	54			
	Diethylformamide m/z 58 44 101*		11.46	3	< 5			
	m/z 97 55 57*		13.9	1	< 5			
	several not identified substances*		14.88-15.1	2	< 5			
1-29	Other not identified alkylbenzenes*	--	15.14	7	7		450	0.02
	m/z 44 117 56*		16.66	1	< 5			
2-10	Cluster isoalkanes, alkenes and/or other alcohols*	--	18.53-20.75	32	32		6000	0.01
3-5	Sesquiterpen*	--	21.78	1	< 5		1400	0.00

+ 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)

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	< 0.77
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	< 0.77

TVOC, Total volatile organic compounds	Concentration after 7 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VOC according to DIN EN 16516	100	78
Sum of VOC according to AgBB 2021	100	78
Sum of VOC according to eco-INSTITUT-Label	120	93
Sum of VOC according to ISO 16000-6	95	73

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	< 3.9
Sum of SVOC without LCI according to AgBB 2021	< 5	< 3.9
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 0.77
Sum of SVOC with LCI according to AgBB 2021	< 5	< 3.9

TVVOC, Total very volatile organic compounds	Concentration after 7 days [µg/m³]	SERa [µg/(m² • h)]
Sum of VVOC according to AgBB 2021	< 5	< 3.9
Sum of VVOC according to eco-INSTITUT-Label	7	5.4

*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 7 days [µg/m³]	SERa [µg/(m² • h)]
VOC without LCI according to AgBB 2021 (sum)	66	51
VOC without LCI according to eco-INSTITUT-Label (sum)	73	56
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K2, M2, R2; IARC: Group 2B; DFG (MAK list): Category III3 (sum)	4	3.1
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV; Regulation (EC) No. 1272/2008: skin sensitising, respiratory sensitising; TRGS 907 (sum)	3	2.3
Bicyclic Terpenes (sum)	< 1	< 0.77
C9 - C14 Alkanes / Isoalkanes as dekane-equivalent (sum)	< 1	< 0.77
C4 - C11 Aldehydes, acyclic, aliphatic (sum)	< 2	< 1.5
C9 - C15 Alkylated benzenes (sum)	1	0.77
Cresols (sum)	< 1	< 0.77

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.09
R-value according to AgBB 2021	0.02
R-value according to Belgian regulation	0.02
R-value according to EU-LCI	0.00

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.

1.3 Carbon disulfide (CS_2, test chamber)

Test parameter:

Carbon disulfide (CS_2)

Test method:

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

Test result:

Internal sample number:	57224-A001

Parameter	Measurement time [days]	Concentration (test chamber) [µg/m³]
Carbon disulfide CS_2	2	2

< q.l. = Value below quantification limit

1.4 Nitrosamines (test chamber)‡#

Test parameter:
Nitrosamines

Test method:

Analytics:	DGUV Information 213-523 (formerly BGI/GUV-I 505-23 respectively ZH1/120.23) Determination of Nitrosamines

Test result:

Internal sample number	Measurement time [days]	Parameter	Concentration (Test chamber) [ng/m³]	Limit of quantification [ng/m³]
57224-A001	2	N-Nitrosodimethylamine (NDMA)	< q.l.	20
		N-Nitrosomethylethylamine (NMEA)	< q.l.	20
		N-Nitrosodiethylamine (NDEA)	45.1	20
		N-Nitrosodiisopropylamine (NDIPA)	< q.l.	20
		N-Nitrosodiisobutylamine (NDIBA)	< q.l.	20
		N-Nitrosodipropylamine (NDPA)	< q.l.	20
		N-Nitrosodibutylamine (NDBA)	< q.l.	20
		N-Nitrosopyrrolidine (NPYR)	< q.l.	20
		N-Nitrosopiperidine (NPIP)	< q.l.	20
		N-Nitrosomorpholine (NMOR)	< q.l.	20

< q.l. = Value below quantification limit

Remark: Concentrations below the limit of determination are between quantification limit and limit of determination and provide only qualitative evidence.

2 Ash content#

Test parameter:
Ash content, filler content

Test method:

Analytics:	Thermogravimetry at 520 °C

Test result:

Internal sample number:	57224-A001

Duplicate Determination	Applied sample amount	Mass aluminium shell	Mass aluminium shell + sample after heating	Mass ash	Ash content	Filler content
	[g]	[g]	[g]	[g]	[%]	[%]
Determination 1	1.4850	39.5277	39.5876	0.0599	4.0	0.0
Determination 2	1.6020	40.2967	40.3640	0.0673	4.2	0.0

Parameter	Content [M%]
Ash content (incl. zinc oxide), with reference to the sample	4.1
Filler content, with reference to the sample [1)]	0.0

[1)] The amount of filler is calculated as difference between the amount of ash and zinc oxide, assuming that the maximum of zinc oxide is 5 % of the total latex foam.

3 Polymer content#

Test parameter:
Relation between natural rubber (NR) and synthetic rubber (SBR)

Test method:

Analytics:	IR/ATR

Test result:

Internal sample number	Polymer content	[weight/%]
57224-A001	NR, with reference to the polymer content [1) 2) 3)]	100
	SBR, with reference to the polymer content	0

[1)] The averaged relative expanded measurement uncertainty (k=2) for for the content of NR is estimated to 34 %.
[2)] If NR-content is below 5 %, the result will be 100 % SBR. Usually there will be no use of NR below 5 % in a mixture of NR and SBR.
[3)] The content of NR is based on the assumption that polyisoprene in latex mattresses is always of natural origin.

4 Odour Testing

Test parameter:

Assessment of odour emissions

Test Method:

Analytics:	Determination of odour as part of the eIL-test, following VDA recommendation 270:2018

Test conditions

Test chamber	see 1 Emission analysis
Air sampling [days]	2
Probands	6
Therefrom female	2
Evaluation Acceptance	Continuous scale from +1 (not perceptible) to +6 (unbearable)

Test result:

Internal sample number:	57224-A001

	Evaluation
Odour intensity after 2 days (arithmetic mean)	2.9

Individual results:

Test person	Odour after 2 days [Note]
Test person 01	2.5
Test person 02	3.0
Test person 03	3.0
Test person 04	3.0
Test person 05	3.0
Test person 06	3.0

Cologne, 12/04/2022

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

Appendix

Sampling sheet

QUL-Label
Probennahmebegleitblatt*

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

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

57224-001

Auftraggeber* / Rechnungsempfänger* (falls abweichend vom Herstellernamen)	Ind. & Handelmij. Riviera B.V. Nijverheidsweg 16 1271 EA HUIZEN (NH) Telefoon 035 - 5250024	**Prüflabor**	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 des Herstellers** ☐ **Name des Händlers** (wenn abweichend vom Auftraggeber)		**Probennehmer*** (Name, Firma, Telefon)	
		Probennahmeort*	Huizen
Prüfstück-/ Artikelbezeichnung*	95 - 15 MeD	**Probeart** (z.B. Naturlatex, pflanzliche Fasern)	
Artikel-Nr.		**Proben-/ Chargen-Nr.***	221024
Modell / Programm / Serie		**Produktionsdatum der Charge***	07.03.2022
Wo wurde die Probe vor Probenahme gelagert?	☐ Fertigung ☐ Lager ☐ Sonstiges	**Datum der Probenahme***	08.03.2022
		Wie wurde das Produkt vor Probenahme gelagert?	☐ offen ☐ verpackt
Lagerort:		**Verpackungsmaterial:**	

Besonderheiten zur Probenahme / ggf. zusätzliche Angaben
(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: 08.03.2022 **Unterschrift/Stempel:** Ind. & Handelmij. Riviera B.V. Nijverheidsweg 16 1271 EA HUIZEN (NH)

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

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
4-Chlor-3-methylphenol (chlorkresole)
2-Phenylphenol (oPP)

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 dimetylether
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
2-hexanone

Acids
Acetic acid
Propionic acid
Isobutyric acid
Butyric acid
Pivalic acid
Valeric acid
Caproic acid
Heptanoic acid
Octanoic acid
2-Ethylhexanoic acid
Neodecanoic 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
Azobis[isobutyronitrile]
Benzophenone
1-buthyl-2-pyrrolidone
Acroleine
Furfuryl alcohol
Decahydronaphthalene
tert.-butyl-methylether (MTBE)

1 VVOC
2 SVOC
3 Analysis acc. to 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 16516:2020-10	Sum of all VOC ≥ 5 µg/m³ in the retention range C_6 to C_{16}, calculated as toluene equivalent (used, among others, with M1)
TVOC according to AgBB	Sum of all identified and calibrated VOC ≥ 5 µg/m³ with LCI and not calibrated VOC ≥ 5 µg/m³ calculated as toluene equivalent (also used, among others, for the Blue Angel)
TVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VOC ≥ 1 µg/m³ and not calibrated VOC ≥ 1 µg/m³ calculated as toluene equivalent (also used for natureplus)
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 (used, among others, by CDPH, BIFMA or the French VOC Regulation)
TVOC without LCI according to AgBB	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	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} (n-hexadecane) to C_{22} (docosane)
TSVOC	Total semi volatile organic compounds
TSVOC according to DIN EN 16516:2020-10	Sum of all SVOC in the retention range C_{16} to C_{22}, calculated as toluene equivalent
TSVOC without LCI according to AgBB	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	Sum of all substance-specific calibrated and 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 substances ≥ 1 µg/m³ with LCI, established by the AgBB
R value according to AgBB	R value for all identified substances ≥ 5 µg/m³ with LCI, established by the AgBB
R value according to Belgian regulation	R value for all identified substances ≥ 5 µg/m³ with LCI, established by the Belgian regulation
R value according to EU-LCI	R value for all identified substances ≥ 5 µg/m³ with EU-LCI value, established by the European Commission
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 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 derivatized with DNPH for the determination of formaldehyde and other short-chain carbonyl compounds (C1 - C6) are analysed using high-performance liquid chromatography (HPLC).

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.

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 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.