

LIEN A Co., Ltd.  
55/1A Khuong Viet Street Phu Trung Ward, Tan Phu District  
Ho Chi Minh City, Vietnam  
VN

## Test Report No. 53329-001-002

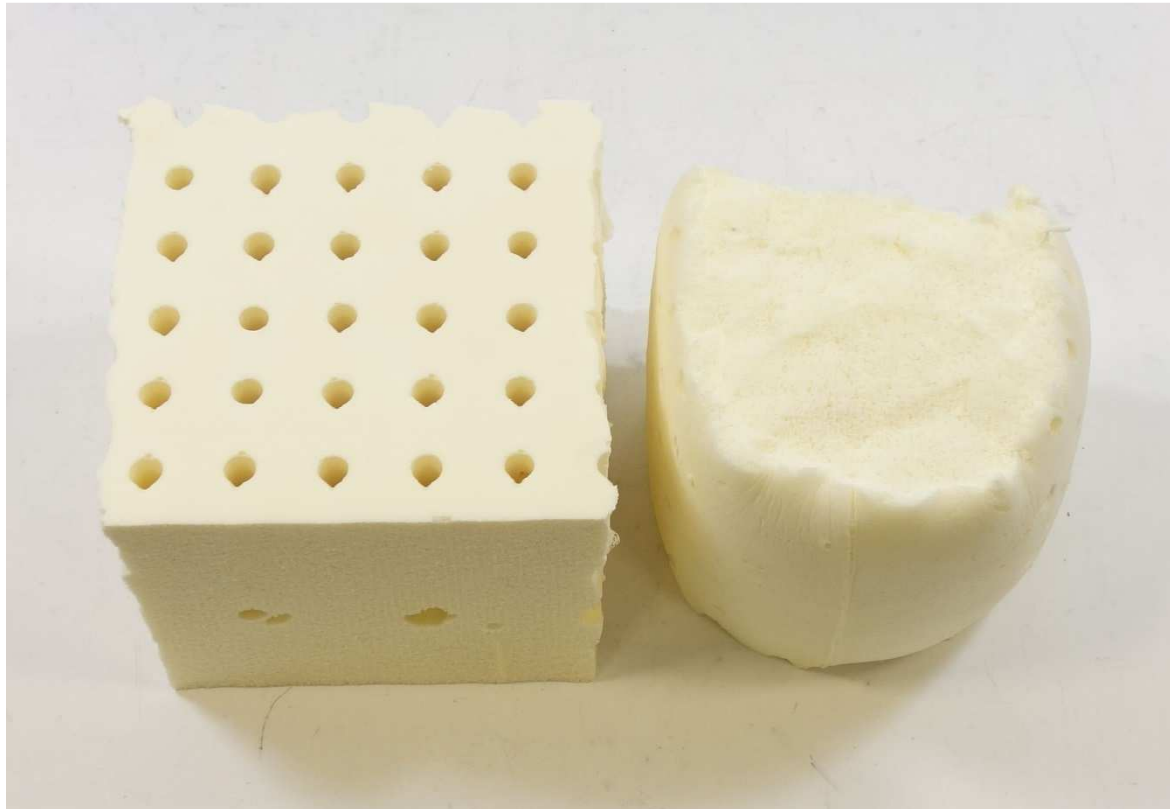
<b>Test objective:</b>	<b>Evaluation according to eco-INSTITUT-Label-criteria</b>
<b>Scope of certification:</b>	<b>Latex mattress core, Pincore Nature latex pillow, oval pillow</b>
<b>Sample description by client:</b>	<b>Latex mattress Pincore Latex Pillow Oval</b>
Sampled by:	Lê Hữu Nghj, International Environment Co., Ltd
Date of sampling:	12.06.2018
Location of sampling:	at the client
Date of production:	10.06.2018
Date of arrival of sample:	02.07.2018
Test period:	02.07.2018 - 24.07.2018
Date of report:	24.07.2018
Number of pages of report:	29
Testing laboratory:	eco-INSTITUT Germany GmbH, Köln except ‡ subcontracted # outside accreditation
Test objective fulfilled:	✓

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## Sample View

Internal Sample-no.	Description by customer	Condition upon delivery	Type of sample
A001	Latex mattress core, Pincore	without objection	Mattress Core
A002	Nature latex pillow, oval pillow	without objection	Nature latex pillow



A001: Latex mattress core, Pincore  
A002: Nature latex pillow, oval pillow

## Evaluation

The products **Latex Mattress Pincore** and **Latex Pillow Oval** were submitted to laboratory tests on behalf of **LIEN A Co., Ltd.** for an ecological product examination according to the eco-INSTITUT-Label test criteria "mattresses/beddings" (status: December 2017).

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

<b>P11 Complete mattress</b>			
<b>Test parameters</b>	<b>Result</b>	<b>Limit Value</b>	<b>Within limits [yes/no]</b>
<b>Emission analysis</b>			
<b>Measurement time: 2 days after test chamber loading</b>			
TVOC (total volatile organic compounds including SVOC with LCI)	66 µg/m <sup>3</sup>	≤ 400 µg/m <sup>3</sup>	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: K1, K2, M1, M2, R1, R2; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1 µg/m <sup>3</sup>	≤ 1 µg/m <sup>3</sup>	yes
Formaldehyde	< 2 µg/m <sup>3</sup>	≤ 24 µg/m <sup>3</sup>	yes
Acetaldehyde	< 2 µg/m <sup>3</sup>	≤ 24 µg/m <sup>3</sup>	yes
<b>Measurement time: 7 days after test chamber loading</b>			
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: K1, K2, M1, M2, R1, R2; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1 µg/m <sup>3</sup>	≤ 1 µg/m <sup>3</sup>	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: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	2 µg/m <sup>3</sup>	≤ 50 µg/m <sup>3</sup>	yes
TVOC (total volatile organic compounds including SVOC with LCI)	20 µg/m <sup>3</sup>	≤ 200 µg/m <sup>3</sup>	yes
TSVOC (total semi-volatile organic compounds)	< 1 µg/m <sup>3</sup>	≤ 40 µg/m <sup>3</sup>	yes
VOC (Sum) without LCI	11 µg/m <sup>3</sup>	≤ 100 µg/m <sup>3</sup>	yes

**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

Test parameters	Result	Limit Value	Within limits [yes/no]
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	< 1 µg/m <sup>3</sup>	≤ 100 µg/m <sup>3</sup>	yes
Bicyclic terpenes (Sum)	< 1 µg/m <sup>3</sup>	≤ 200 µg/m <sup>3</sup>	yes
C9 – C14 Alkanes / Isoalkanes (Sum)	2 µg/m <sup>3</sup>	≤ 200 µg/m <sup>3</sup>	yes
C4 – C11 Aldehydes, acyclic, aliphatic (Sum)	< 2 µg/m <sup>3</sup>	≤ 100 µg/m <sup>3</sup>	yes
C6 – C15 Alkyl benzenes (Sum)	3 µg/m <sup>3</sup>	≤ 100 µg/m <sup>3</sup>	yes
Cresols (Sum)	< 1 µg/m <sup>3</sup>	≤ 5 µg/m <sup>3</sup>	yes
VOC (individual substances):			
Styrene	< 1 µg/m <sup>3</sup>	≤ 10 µg/m <sup>3</sup>	yes
Phenole	< 1 µg/m <sup>3</sup>	≤ 20 µg/m <sup>3</sup>	yes
Methylisothiazolinone (MIT)	< 1 µg/m <sup>3</sup>	≤ 1 µg/m <sup>3</sup>	yes
Benzaldehyde	< 1 µg/m <sup>3</sup>	≤ 20 µg/m <sup>3</sup>	yes
2-Ethyl-1-hexanol	< 1 µg/m <sup>3</sup>	≤ 100 µg/m <sup>3</sup>	yes
Ethylen glycol monobutylether	< 1 µg/m <sup>3</sup>	≤ 100 µg/m <sup>3</sup>	yes
2-Hexoxyethanol	< 1 µg/m <sup>3</sup>	≤ 100 µg/m <sup>3</sup>	yes
Methylisobutylketone	< 1 µg/m <sup>3</sup>	≤ 100 µg/m <sup>3</sup>	yes
2-Butoxyethylacetate	< 1 µg/m <sup>3</sup>	≤ 200 µg/m <sup>3</sup>	yes
Glycol ethers with insufficient data* (Limit value per single substance):	< 0.0025 ppm	< 0.0025 ppm	yes
R-Value	0.02	≤ 1.0	yes

\* cf. Announcement of the Ad-hoc Working Group on Indoor Guidelines of the Indoor Air Hygiene Committee and of the Supreme State Health Authorities: Richtwerte für Glykolether und Glykolester in der Innenraumlufte, Bundesgesundheitsblatt, February 2013, Volume 56, Issue 2, pp 286-320.  
 An exceedance of this limit value will not yet result automatically in a refusal.

**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

<b>P11 Complete mattress</b>			
<b>Test parameter</b>	<b>Result / Emission</b>	<b>Limit value</b>	<b>Within limits [yes/no]</b>
<b>Emission test</b>			
Nitrosamines (only latex products)	A001 A002 < q.l.	≤ 300 ng/m <sup>3</sup>	yes
Disulphide (only latex products)	A001 A002 3 µg/m <sup>3</sup>	≤ 50 µg/m <sup>3</sup>	yes
Odour	A002 Grade 2.3	≤ Grade 3 (24 hours after loading of desiccator)	yes

<b>P31 Upholstery / padding materials: Latex</b>			
<b>Test parameter</b>	<b>Result / Emission</b>	<b>Limit value</b>	<b>Within limits [yes/no]</b>
<b>Content analysis</b>			
Polymer content (NR: natural rubber)	A001 100 % NR	not applicable	not applicable
Polymer content (NR: natural rubber)	A002 100 % NR	not applicable	not applicable
Filler content	A002 0.0 %	≤ 5 %	yes

< q.l. = Value below quantification limit

## Summary evaluation

The products **Latex Mattress Pincore** and **Latex Pillow Oval** were submitted to an ecological product examination on behalf of **LIEN A Co., Ltd.** for the acquisition of the eco-INSTITUT-Label.

The eco-INSTITUT-Label criteria were successfully fulfilled.

As a result of the successful ecological product examination the

### eco-INSTITUT-Label



is awarded for the products:

**Latex Mattress Pincore\***

**Latex pillow Oval\***

\*This certification is valid only for the foam. Any other materials that might be used in combination with the foam (e.g. cover materials or adhesives) are excluded from the certification.

for a period of two years.

Certification number	ID 0310 – 12246 – 001
Test report Number	53329-001-002
Validity	06/2020

After expiration of two years it is possible to acquire the eco-INSTITUT-Label for another two year period. For this a pre-certification review and a laboratory test will be accomplished according to the latest eco-INSTITUT-Label test criteria.

Cologne, 24.07.2018



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

# Laboratory report

## 1 Emission analysis

### Test method

DIN EN 16516	Testing and evaluation of the release of dangerous substances; determination of emissions into indoor air
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### A001, A002, Preparation of test sample

Date:	03.07.2018
Pre-treatment:	not applicable;
Masking of backside:	no
Masking of edges:	no
Relationship of unmasked edges to surface:	not applicable
Loading:	related to area
Dimensions:	12.5 cm x 12.5 cm x 10 cm + 10.6 cm x 10.5 cm x appx. 14 cm

### A001, A002, Test chamber conditions according to DIN ISO 16000-9

Chamber volume:	0.125 m <sup>3</sup>
Temperature:	23°C ± 1°C
Relative humidity:	50 % ± 1 %
Air pressure:	normal
Air:	cleaned
Air change rate:	1.0 h <sup>-1</sup>
Air velocity:	0.3 m/s
Loading:	1.3 m <sup>2</sup> /m <sup>3</sup>
Specific air flow rate:	0.769 m <sup>3</sup> /(m <sup>2</sup> · h)
Air sampling:	2 days after test chamber loading 7 days after test chamber loading

### Analytics

Aldehydes and Ketones	DIN ISO 16000-3
Limit of determination:	2 µg/m <sup>3</sup>
Volatile Organic Compounds	DIN ISO 16000-6
Limit of determination:	1 µg/m <sup>3</sup> (BIT: 5 µg/m <sup>3</sup> )
Note for analysis:	not specified



## 1.1 Sample A001, Sample A002, Volatile Organic Compounds after 2 days

### Test objective:

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

### Test result:

Sample:

A001: Latex mattress core, Pincore  
 A002: Nature latex pillow, oval pillow

No.	Substance	CAS No.	RT [min]	Concentration+ (test chamber air)	Toluene- equivalent	CMR	LCI	R-value
				Substances ≥ 1 µg/m³ 2 days [µg/m³]	Substances ≥ 5 µg/m³ 2 days [µg/m³]	Classifi- cation++	AgBB 2015 [µg/m³]	
<b>1</b>	<b>Aromatic hydrocarbons</b>							
1-11	1.2.4-Trimethylbenzene	95-63-6	13.01	2			450	0.00
1-17	1.2.4.5-Tetramethyl benzene	95-93-2	15.77	4			500	0.01
<b>2</b>	<b>Aliphatic hydrocarbons (n-, iso- and cyclo-)</b>							
2-10.2	n-Decane	124-18-5	12.80	2			6000	0.00
2-10.4	n-Dodecane	112-40-3	16.99	3			6000	0.00
2-10.6	n-Tetradecane	629-59-4	21.58	1			6000	0.00
<b>7</b>	<b>Aldehyde</b>							
7-20	Acetaldehyde	75-07-0		2		Carc. 2	1200	0.00
<b>8</b>	<b>Ketones</b>							
8-10	Acetone	67-64-1		3			1200	0.00
<b>9</b>	<b>Acids</b>							
9-1	Acetic acid	64-19-7	4.52	5			1250	0.00
<b>10</b>	<b>Esters</b>							
10-15	n-Butyl acrylate	141-32-2	10.42	8	6	Group 3	110	0.07

**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

No.	Substance	CAS No.	RT [min]	Concentration+ (test chamber air)	Toluene- equivalent	CMR	LCI	R-value
				Substances ≥ 1 µg/m³ 2 days [µg/m³]	Substances ≥ 5 µg/m³ 2 days [µg/m³]	Classifi- cation++	AgBB 2015 [µg/m³]	
13	<b>Other identified substances in addition to LCI list</b>							
	Benzothiazole	95-16-9	18.44	4				
2-10	2,2,4,6,6- Pentamethylheptane	13475-82-6	12.77	14	16		6000	0.00
	Hexamethylcyclotrisiloxane (D3)	541-05-9	8.39	1				
	Diethylamine*		4.54	13				
	Butyl ether*		10.14	1				
	N,N-Diethylformamide*		11.42	2				
1-29	Other not identified alkylbenzenes*	--	12.20	1			450	0.00
	Butyl butyrate*		12.63	3				
2-10	Other saturated aliphatic hydrocarbons C9 - C16*	--	13.64	3			6000	0.00
1-29	Other not identified alkylbenzenes*	--	14.96	3			450	0.01
1-29	Other not identified alkylbenzenes*	--	15.45	1			450	0.00
1-29	Other not identified alkylbenzenes*	--	15.68	2			450	0.00
	not identified*		16.41	1				
1-29	Other not identified alkylbenzenes*	--	16.50	3			450	0.01
	Sesquiterpene*		21.77	2				

+ 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: K1 and K2, M1 and M2, R1 and R2, IARC: Group 1 and 2A, DFG MAK-list: Kategorie III1 and III2

\* unidentified substance, calculated as toluene equivalent

<b>Carcinogenic, mutagenic and reproductive toxic components*</b>	<b>Concentration after 2 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
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: K1, K2, M1, M2, R1, R2; 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 (Sum)	< 1	< 0.77

<b>TVOC, Total volatile organic compounds</b>	<b>Concentration after 2 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
Sum of VOC according to DIN EN 16516	22	17
Sum of VOC according to AgBB 2015 / DIBt	27	21
Sum of VOC according to eco-INSTITUT-Label	66	51
Sum of VOC according to ISO 16000-6	100	77

<b>TSVOC, Total semi volatile organic compounds</b>	<b>Concentration after 2 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
Sum of SVOC according to DIN EN 16516	< 5	< 3.85
Sum of SVOC without LCI according to AgBB 2015 / DIBt	< 5	< 3.85
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 0.77
Sum of SVOC with LCI according to AgBB 2015 / DIBt	< 5	< 3.85

<b>TVVOC, Total very volatile organic compounds</b>	<b>Concentration after 2 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
Sum of VVOC according to AgBB 2015 / DIBt and Belgian regulation	13	10
Sum of VVOC according to eco-INSTITUT-Label	18	14

\*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).

**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

<b>Other sums of VOC</b>	<b>Concentration after 2 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	< 5	< 3.85
VOC without LCI according to eco-INSTITUT-Label (Sum)	14	11
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)	2	1.5
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	8	6.2
Bicyclic Terpenes	< 1	< 0.77
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	23	18
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	< 2	< 1.54
C9 - C15 Alkylated benzenes (Sum)	6	4.6
Kresoles (Sum)	< 1	< 0.77

<b>Risk value for assessment of LCI</b>	<b>R-value</b>
R-value according to eco-INSTITUT-Label	0.12
R-value according to AgBB 2015 / DIBt	0.08
R-value according to Belgian regulation	0.08
R-value according to AFSSET	0.10

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

**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

## 1.2 Sample A001, Sample A002, Volatile Organic Compounds after 7 days

### Test objective:

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

### Test result:

Sample:

A001: Latex mattress core, Pincore  
 A002: Nature latex pillow, oval pillow

No.	Substance	CAS No.	RT [min]	Concentration+ (test chamber air)  Substances ≥ 1 µg/m³ after 7 days [µg/m³]	Toluene- equivalent  Substances ≥ 5 µg/m³ after 7 days [µg/m³]	CMR  Classifi- cation++	LCI  AgBB 2015 [µg/m³]	R-value
<b>1</b>	<b>Aromatic hydrocarbons</b>							
1-17	1,2,4,5-Tetramethyl benzene	95-93-2	15.76	3			500	0.01
<b>2</b>	<b>Aliphatic hydrocarbons (n-, iso- and cyclo-)</b>							
2-10.4	n-Dodecane	112-40-3	16.98	2			6000	0.00
<b>7</b>	<b>Aldehyde</b>							
7-20	Acetaldehyde	75-07-0		2		Carc. 2	1200	0.00
<b>8</b>	<b>Ketones</b>							
8-10	Acetone	67-64-1		3			1200	0.00
<b>9</b>	<b>Acids</b>							
9-1	Acetic acid	64-19-7	4.51	2			1250	0.00

Remark: The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

No.	Substance	CAS No.	RT [min]	Concentration+ (test chamber air)	Toluene- equivalent	CMR	LCI	R-value
				Substances ≥ 1 µg/m³ after 7 days [µg/m³]	Substances ≥ 5 µg/m³ after 7 days [µg/m³]	Classifi- cation++	AgBB 2015 [µg/m³]	
13	<b>Other identified substances in addition to LCI list</b>							
	Benzothiazole	95-16-9	18.44	5				
	Hexamethylcyclotrisiloxane (D3)	541-05-9	8.39	2				
	Diethylamine*		4.54	5				
	N,N-Diethylformamide*		11.42	1				
1-29	Other not identified alkylbenzenes*	--	14.96	1			450	0.00
1-29	Other not identified alkylbenzenes*	--	15.68	1			450	0.00
	Other not identified alkylbenzenes*		16.50	1				
	Sesquiterpene*		21.77	2				

+ 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: K1 and K2, M1 and M2, R1 and R2, IARC: Group 1 and 2A, DFG MAK-list: Kategorie III1 and III2

\* unidentified substance, calculated as toluene equivalent

<b>Carcinogenic, mutagenic and reproductive toxic components*</b>	<b>Concentration after 7 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
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: K1, K2, M1, M2, R1, R2; 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 (Sum)	< 1	< 0.77

<b>TVOC, Total volatile organic compounds</b>	<b>Concentration after 7 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
Sum of VOC according to DIN EN 16516	< 5	< 3.85
Sum of VOC according to AgBB 2015 / DIBt	5	3.9
Sum of VOC according to eco-INSTITUT-Label	20	15
Sum of VOC according to ISO 16000-6	45	35

<b>TSVOC, Total semi volatile organic compounds</b>	<b>Concentration after 7 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
Sum of SVOC according to DIN EN 16516	< 5	< 3.85
Sum of SVOC without LCI according to AgBB 2015 / DIBt	< 5	< 3.85
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 0.77
Sum of SVOC with LCI according to AgBB 2015 / DIBt	< 5	< 3.85

<b>TVVOC, Total very volatile organic compounds</b>	<b>Concentration after 7 days [µg/m³]</b>	<b>SERa [µg/(m² · h)]</b>
Sum of VVOC according to AgBB 2015 / DIBt and Belgian regulation	5	3.9
Sum of VVOC according to eco-INSTITUT-Label	10	7.7

\*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).

**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

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)	5	3.9
VOC without LCI according to eco-INSTITUT-Label (Sum)	11	8.5
CMR 2: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 2, Muta. 2, Repr. 2; TRGS 905: K3; IARC: Group 2B; DFG (MAK list): Category III3 (Sum)	2	1.5
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	< 1	< 0.77
Bicyclic Terpenes	< 1	< 0.77
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	2	1.5
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	< 2	< 1.54
C9 - C15 Alkylated benzenes (Sum)	3	2.3
Cresols (Sum)	< 1	< 0.77

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.02
R-value according to AgBB 2015 / DIBt	0.00
R-value according to Belgian regulation	0.00
R-value according to AFSSET	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.

**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.



### 1.3 Nitrosamines (test chamber)‡

**Test parameter:**

Nitrosamines

**Test method:**

Analytics: | BGI 505-23 Determination of Nitrosamines

**Test result:**

Sample	Measurement time [days]	Parameter	Limit of determination [ng/m <sup>3</sup> ]	Concentration (Test chamber) [ng/m <sup>3</sup> ]
A001: Latex mattress core, Pincore A002: Nature latex pillow, oval pillow	2	N-Nitrosodimethylamine (NDMA)	50	< q.l.
		N-Nitrosomethylethylamine (NMEA)	50	< q.l.
		N-Nitrosodiethylamine (NDEA)	50	< q.l.
		N-Nitrosodiisopropylamine (NDIPA)	50	< q.l.
		N-Nitrosodiisobutylamin (NDIBA)	50	< q.l.
		N-Nitrosodipropylamine (NDPA)	50	< q.l.
		N-Nitrosodibutylamine (NDBA)	50	< q.l.
		N-Nitrosopyrrolidine (NPYR)	50	< q.l.
		N-Nitrosopiperidine (NPIP)	50	< q.l.
		N-Nitrosomorpholine (NMOR)	50	< q.l.

< 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.

## 1.4 Carbon disulfide (CS<sub>2</sub>, test chamber)

**Test parameter:**

Carbon disulfide (CS<sub>2</sub>)

**Test method:**

Analytics:	DIN ISO 16000-6
Limit of determination:	1 µg/m <sup>3</sup>

**Test result:**

Sample	Parameter	Measurement time [days]	Concentration (test chamber) [µg/m <sup>3</sup> ]
A001: Latex mattress core, Pincore A002: Nature latex pillow, oval pillow	Carbon disulfide CS <sub>2</sub>	2	3

< q.l. = Value below quantification limit

## 2 Odour test following VDA recommendation 270

**Test parameter:**

Odour

**Test method:**

Analytics:	VDA-recommendation 270
Rating:	1 not perceptible 2 perceptible, not bothering 3 clearly perceptible, not bothering 4 bothering 5 strongly bothering 6 unbearable

### A002, Conditions of dessicator

Temperature:	40°C
Relative humidity:	50%
Sampling time:	24 hours after loading of dessicator
Loading:	1.3 m <sup>2</sup> /m <sup>3</sup>
Sample size:	39.0 cm <sup>2</sup>
Absolute application amount:	not applicable

**Test result:**

Sample	Intensity of odour [Grade]
A002: Nature latex pillow, oval pillow	2.3

### 3 Polymer content#

**Test parameter:**

Relation between natural rubber (NR) and synthetic rubber (SBR)

**Test method:**

Analytics: | IR/ATR

**Test result:**

Sample	Polymer content	[weight/%]
A001: Latex mattress core, Pincore	NR, with reference to the polymer content <sup>1) 2)</sup>	100
	SBR, with reference to the polymer content	0

Sample	Polymer content	[weight/%]
A002: Nature latex pillow, oval pillow	NR, with reference to the polymer content <sup>1) 2)</sup>	100
	SBR, with reference to the polymer content	0

<sup>1)</sup> 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.

<sup>2)</sup> The content of NR is based on the assumption that polyisoprene in latex mattresses is always of natural origin.

## 4 Ash content<sup>#</sup>

**Test parameter:**

Ash content, filler content

**Test method:**

Analytics: | Thermogravimetry

**Test result:**

Sample	Parameter	[weight%]
A002: Nature latex pillow, oval pillow	Ash content (incl. zinc oxide), with reference to the sample	3.5
	Filler content, with reference to the sample <sup>1)</sup>	0.0

<sup>1)</sup> 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.

Cologne, 24.07.2018



Michael Stein, Dipl.-Chem.  
(Deputy Technical Manager)

# Appendix

## I Sampling sheets

Produktprüfung Product testing  
 Zertifizierung Certification  
 Beratung Consulting



eco-INSTITUT-Label  
 Sampling Sheet\*



Project number  
 eco-INSTITUT /  
 will be filled in  
 by Laboratory

**53329-001**

<b>Testing laboratory</b>	eco-INSTITUT Germany GmbH Schanzenstr. 6-20, D-51063 Cologne Tel. +49 (0)221 - 931245-0 Fax +49 (0)221 - 931245-33	<b>Sampler (Name, Company, Phone)</b>	Lê Hữu Nghị International Enviroment Co., Ltd No. 247/5, Bui Thi Xuan Str., No. 1 Ward, Tan Binh Dist., HCMC, Vietnam 08 62924344
<b>Name of manufacturer / distributor at place of sampling (Address / Stamp)</b>	Lien A Co., Ltd 55/1A Khuong Viet Street, Phu Trung ward, Tan Phu district, Ho Chi Minh city, Vietnam	<b>Customer/ Invoice recipient (if different from manufacturer)</b>	

<b>Product name</b>	Latex mattress core	<b>Product type (e.g. parquet, floor covering)</b>	Mattress core
<b>Model / programme / series</b>	Pincore	<b>Batch</b>	0406100001
<b>Article number</b>		<b>Production date of batch</b>	10.06.18

<b>Samples are taken from</b>	<input checked="" type="checkbox"/> current production <input type="checkbox"/> storage	<b>Sampling date</b>	12.06.18
<b>Storage location before sampling</b>	<input checked="" type="checkbox"/> production <input type="checkbox"/> storage <input type="checkbox"/> other: Storage location:	<b>Sampling time</b>	16:00
		<b>Storage conditions before sampling</b>	<input checked="" type="checkbox"/> open <input type="checkbox"/> packaged Packaging material:

**Special features** (possible negative effects through emissions at place of sampling (e.g. benzine, exhaust fumes), unclarities, questions etc.)

**Validation**  
 Hereby the signer affirms the accuracy of the above-mentioned statements. The sample was chosen, sampled and packaged according to the sampling guidelines.

Date: \_\_\_\_\_  
 Signature: \_\_\_\_\_  
 (Stamp)

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

**Order**

(Please insert quote number, or - if not available, please enter the desired analysis)

**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

Produktprüfung Product testing  
 Zertifizierung Certification  
 Beratung Consulting



eco-INSTITUT-Label  
 Sampling Sheet\*



Project number  
 eco-INSTITUT /  
 will be filled in  
 by Laboratory

**53329-002**

<b>Testing laboratory</b>	eco-INSTITUT Germany GmbH Schanzenstr. 6-20, D-51063 Cologne Tel. +49 (0)221 - 931245-0 Fax +49 (0)221 - 931245-33	<b>Sampler</b> (Name, Company, Phone)	Lê Hữu Nghị International Enviroment Co., Ltd 247/5 Bui Thi Xuan street, ward 1, Tan Binh district, HCMcity, Vietnam 028 62924344
<b>Name of manufacturer / distributor at place of sampling</b> (Address / Stamp)	Lien A Co., Ltd 55/1A Khuong Viet Street, Phu Trung ward, Tan Phu district, Ho Chi Minh city, Vietnam	<b>Customer/ Invoice recipient</b> (if different from manufacturer)	

<b>Product name</b>	Nature latex pillow	<b>Product type</b> (e.g. parquet, floor covering)	Nature latex pillow
<b>Model / programme / series</b>	Oval pillow	<b>Batch</b>	0406250001
<b>Article number</b>		<b>Production date of batch</b>	25.06.18

<b>Samples are taken from</b>	<input checked="" type="checkbox"/> current production <input type="checkbox"/> storage	<b>Sampling date</b>	25.06.18
<b>Storage location before sampling</b>	<input checked="" type="checkbox"/> production <input type="checkbox"/> storage <input type="checkbox"/> other: Storage location:	<b>Sampling time</b>	16:00
		<b>Storage conditions before sampling</b>	<input checked="" type="checkbox"/> open <input type="checkbox"/> packaged Packaging material:

**Special features** (possible negative effects through emissions at place of sampling (e.g. benzine, exhaust fumes), unclarities, questions etc.)

**Validation**  
 Hereby the signer affirms the accuracy of the above-mentioned statements. The sample was chosen, sampled and packaged according to the sampling guidelines.

Date: \_\_\_\_\_

Signature: \_\_\_\_\_  
 (Stamp)

*GIAM ĐOC*  
*Lê Hữu Nghị*

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

**Order**  
 (Please insert quote number, or - if not available, please enter the desired analysis)

eco-INSTITUT Germany GmbH / Schanzenstrasse 6-20 / Carlswerk 1.19 / D-51063 Köln / Germany  
 Tel. +49 221.931245-0 / Fax +49 221.931245-33 / eco-institut.de / Geschäftsführer: Dr. Frank Kuebart, Daniel Tigges  
 HRB 17917 / USt-ID: DE 122653308 / Raiffeisenbank Frechen-Hürth, IBAN: DE60370623651701900010, BIC: GENODE33HAN



**Remark:** The test result referred to the submitted test sample exclusively. The validity of the report is three years at most and will end immediately at any alternation of material composition or in manufacturing process. Publishing in parts requires authorisation.

## II 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 <sub>6</sub> (n-Hexane) to C <sub>16</sub> (n-Hexadecane)
TVOC	Total volatile organic compounds
TVOC according to prEN 16516	Sum of all VOC $\geq 5 \mu\text{g}/\text{m}^3$ in the retention range C <sub>6</sub> to C <sub>16</sub> , 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	Total area of chromatogram in the retention range C <sub>6</sub> to C <sub>16</sub> , 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 <sub>6</sub> to C <sub>16</sub>
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 <sub>6</sub> to C <sub>16</sub>
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: K1 and K2, M1 and M2, R1 and R2 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 $< \text{C}_6$
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 <sub>16</sub> to C <sub>22</sub>
TSVOC	Total semi volatile organic compounds
TSVOC according to prEN 16516	Sum of all SVOC in the retention range C <sub>16</sub> to C <sub>22</sub> , 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 appendix IV)



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 2015
R value according to AgBB 2015/DIBt	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2015
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

### III 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-Phenyldecane<sup>2</sup>  
1-Phenylundecane<sup>2</sup>  
4-Phenylcyclohexene  
Styrene  
β-Methylstyrene  
Phenylacetylene  
2-Phenylpropene  
Vinyltoluene  
Naphthalene  
Indene  
Benzene  
1-Methylnaphthalene  
2-Methylnaphthalene  
1,4-Dimethylnaphthalene  
3-Propyltoluene  
2-Propyltoluene

#### Saturated aliphatic substances

2-Methylpentane<sup>1</sup>  
3-Methylpentane<sup>1</sup>  
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

δ-3-Carene  
α-Pinene  
β-Pinene

Limonene  
Longifolene  
β-Caryophyllene  
α-Phellandrene  
Myrcene  
Camphene  
α-Terpinene  
Longipinene  
trans-β-Farnesene  
cis-β-Farnesene

#### Aliphatic alcohols and ether

1-Propanol<sup>1</sup>  
2-Propanol<sup>1</sup>  
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

#### Aromatic alcohols (phenoles)

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

#### Glycols, Glycol ether, Glycol ester

Propyleneglycol (1,2-Dihydroxypropane)  
Ethylene glycol (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-2-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-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)  
Ethylidiglycol  
Dipropylene glycol dimethylene ether  
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

#### Aldehydes

Butanal<sup>1,3</sup>  
3-Methyl-1-butanol  
Pentanal<sup>3</sup>  
Hexanal  
Heptanal  
2-Ethylhexanal  
Octanal  
Nonanal  
Decanal  
2-Butenal<sup>3</sup>  
2-Pentenal<sup>3</sup>  
2-Hexenal  
2-Heptenal  
2-Octenal  
2-Nonenal  
2-Decenal  
2-Undecenal  
Furfural  
Ethanediol (Glyoxal)<sup>1,3</sup>  
Glutaraldehyde  
Benzaldehyde  
Acetaldehyde<sup>1,3</sup>  
Formaldehyde<sup>1,3</sup>  
Propanal<sup>1,3</sup>  
Propenal<sup>1,3</sup>  
Isobutanol<sup>3</sup>

#### Ketones

Ethylmethylketone<sup>3</sup>  
3-Methyl-2-butanone  
Methylisobutylketone  
Cyclopentanone  
Cyclohexanone  
Acetone<sup>1,3</sup>  
2-Methylcyclopentanone  
2-Methylcyclohexanone  
Acetophenone  
1-Hydroxyacetone  
2-Heptanone

**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<sup>1</sup>  
Ethyl acetate<sup>1</sup>  
Vinyl acetate<sup>1</sup>  
Isopropyl acetate  
Propyl acetate  
2-Methoxy-1-methylethyl acetate  
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<sup>2</sup>  
Dipropylphthalate<sup>2</sup>  
Dibutylphthalate<sup>2</sup>  
Diisobutylphthalate<sup>2</sup>  
Texanol  
Dipropylene glycoldiacrylate

**Chlorinated hydrocarbons**

Tetrachlorethene  
1,1,1-Trichlorethane  
Trichlorethene  
1,4-Dichlorbenzene

**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)  
Triethylamine  
Decamethylcyclopentasiloxane  
Dodecamethylcyclohexasiloxane

Tetrahydrofuran (THF)  
1-Decene  
1-Octene  
2-Pentylfurane  
2-Methylfurane  
Isophorone  
Tetramethyl succinonitrile  
Dimethylformamide (DMF)  
Tributyl phosphate  
N-Ethyl-2-pyrrolidone  
Aniline  
4-Vinylcyclohexene  
Dimethoxymethane  
Dichlormethane  
Carbon tetrachloride  
Chlorobenzene  
trans-Decahydronaphthalene  
cis-Decahydronaphthalene  
Linalyl acetate  
Chloroform  
Chloroprene (monomer)  
Acetamide  
Formamide  
1,3-Dichlor-2-propanol  
2-n-Octyl-4-isothiazolin-3-one (OIT)  
1,2-Benzylisothiazolin-3-one (BIT)

- 1 VVOC
- 2 SVOC
- 3 Analysis according to DIN ISO 16000-3

## IV 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.

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 internal standard d8 toluene. As far as possible, identification and quantification limit of any substance shall be 1 µg per m<sup>3</sup> for substances adsorbed on Tenax and 2 µg/m<sup>3</sup> for DNPH-derivatized substances (limit of quantification).

### Quality assurance

The eco-INSTITUT Germany GmbH is granted flexible scope of accreditation pursuant to DIN EN ISO/IEC 17025. 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. 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.

## V 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 <sup>2</sup> )	relation between emission and surface
v = unit volume (m <sup>3</sup> )	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 <sub>l</sub> in µg/(m·h)
surface-specific	SER <sub>a</sub> in µg/(m <sup>2</sup> ·h)
volume-specific	SER <sub>v</sub> in µg/(m <sup>3</sup> ·h)
unit specific	SER <sub>u</sub> 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.

$$\text{SER} = q \cdot c$$

- 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.