



eco-INSTITUT Germany GmbH

Laborprüfung
Laboratory testing

Papapanagiotu AG - Dromeas
Industriegebiet von Serres
62121 Lefkonas Serres
Griechenland

Test Report No. 55457-001

Test objective:	Evaluation according to DE-UZ 117 (Blue Angel)
Sample description by client:	SMART Bürodrehstuhl
Sampled by:	Konstaninos Papapanagiotou
Date of sampling:	10.07.2020
Location of sampling:	at the client
Date of production:	10.07.2020
Date of arrival of sample:	21.07.2020
Test period:	21.07.2020 - 02.09.2020
Date of report:	07.09.2020
Number of pages of report:	21
Testing laboratory:	eco-INSTITUT Germany GmbH, Köln except ‡ subcontracted # outside accreditation
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





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Sample View

Internal Sample-no.	Description by customer	Condition upon delivery	Type of sample
A001	SMART Bürodrehstuhl	without objection	Stuhl



A001: SMART Bürodrehstuhl

Statement of conformity with the criteria of DE-UZ 117

The product **SMART Bürodrehstuhl** has been tested on behalf of **Papapanagiotu AG - Dromeas**.

This evaluation is based on the test criteria „Low-Emission Upholstered Furniture“ - DE-UZ 117 (Issue: January 2018) of the Blue Angel of RAL gGmbH.

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

Test parameter	Concentration (test chamber air)	Requirement Concentration (test chamber air)	Product specific emission rate (per chair)	Requirement Product specific emission rate (per chair)	Requirement hold [yes/no]
Emission analysis					
Measurement time: 3 days after test chamber loading					
Carcinogenic substance, Kat. 1A and 1B acc. to Regulation (EC) No. 1272/2008	< 1 µg/m ³	≤ 10 µg/m ³ (sum)	--	--	yes
Measurement time: 28 days after test chamber loading					
Formaldehyde	< 2 µg/m ³	≤ 40 µg/m ³ ¹⁾	< 8,06 µg/h	≤ 80 µg/h	yes
Other Aldehydes (sum)	< 2 µg/m ³	≤ 40 µg/m ³	< 8,06 µg/h	≤ 80 µg/h	yes
Total organic compounds within the retention range of C6 to C16 (TVOC) ²⁾	15 µg/m ³	≤ 300 µg/m ³	< 60 µg/h	≤ 600 µg/h	yes
Total organic compounds within the retention range > C16 - C22 (TSVOC) ²⁾	< 5 µg/m ³	≤ 50 µg/m ³	< 20,15 µg/h	≤ 100 µg/h	yes
Carcinogenic substance, Kat. 1A and 1B acc. to Regulation (EC) No. 1272/2008	< 1 µg/m ³	≤ 1 µg/m ³ (per substance)	--	--	yes
Reprotoxic substances without LCI, Kat. 1A and 1B acc. to Regulation (EC) No. 1272/2008	< 1 µg/m ³	≤ 20 µg/m ³ (sum)	--	--	yes
Sum VOC without LCI	7 µg/m ³	≤ 100 µg/m ³	--	--	yes
R value	0.01	≤ 1	--	--	yes

1) 60 µg/m³ = 0,05 ppm

2) for TVOC and TSVOC only substances ≥ 5 µg/m³ are considered

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 parameter	Result	Limit value	Within limits [yes/no]
Odour	A001 Grade 1,6	≤ Grade 3 (28 days after test chamber loading)	yes

Summary statement of conformity

The product **SMART Bürodrehstuhl** meets the emission requirements of DE-UZ 117.

Cologne, 07.09.2020

A handwritten signature in black ink, reading "M.-A. Dobaj". The signature is written in a cursive style with a long, sweeping flourish extending to the right.

Marc-Anton Dobaj, M.Sc. Crystalline Materials
(Project Manager)

Laboratory report

1 Emission analysis

Test method

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

A001, Preparation of test sample

Date:	31.07.2020
Sample preparation:	not applicable
Masking of backside:	not applicable
Masking of edges:	no
Relationship of unmasked edges to surface:	not applicable
Loading:	related to the entire unit
Dimensions:	complete test sample

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

Chamber volume:	3 m ³
Temperature:	23°C ± 1°C
Relative humidity:	50 % ± 1 %
Air pressure:	normal
Air:	cleaned
Air change rate:	1.3 h ⁻¹
Air velocity:	0.3 m/s
Loading:	0.33 unit/m ³
Specific air flow rate:	4.03 m ³ /(unit · h)
Air sampling:	3 days after test chamber loading 14 days after test chamber loading 28 days after test chamber loading

Analytics

Aldehydes and Ketones	DIN ISO 16000-3:2013-01
Limit of determination:	2 µg/m ³
Volatile Organic Compounds	DIN ISO 16000-6:2012-11
Limit of determination:	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 3 days

Test objective:

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

Test result:

Sample: A001: SMART Bürodrehstuhl

No.	Substance	CAS No.	RT [min]	Concentration+	Toluene-equivalent	CMR Classifi- cation++	LCI	R-value
				Substances ≥ 1 µg/m³ [µg/m³]	Substances ≥ 5 µg/m³ [µg/m³]		AgBB 2018 [µg/m³]	
5	Aromatic alcohols							
5-2	BHT (2,6-di-tert-butyl-4-methylphenol)	128-37-0	24	1		Group 3	100	0.01
7	Aldehydes							
7-7	Nonanal	124-19-6	15.42	2			900	0.00
7-22	Formaldehyde	50-00-0		3		Carc. 1B Muta. 2	100	0.03
9	Acids							
9-1	Acetic acid	64-19-7	4.69	8			1200	0.01
13	Other identified substances in addition to LCI list							
	Triethylendiamine m/z 42 55 112*		13.91	16	16			

+ 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]	SER_{in} [µg/(u · h)]
CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1	< 4.03
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 4.03

TVOC, Total volatile organic compounds	Concentration after 3 days [µg/m³]	SER_{in} [µg/(u · h)]
Sum of VOC according to DIN EN 16516	16	64
Sum of VOC according to AgBB 2018 / DIBt	24	97
Sum of VOC according to eco-INSTITUT-Label	27	110
Sum of VOC according to ISO 16000-6	40	160

TSVOC, Total semi volatile organic compounds	Concentration after 3 days [µg/m³]	SER_{in} [µg/(u · h)]
Sum of SVOC according to DIN EN 16516	< 5	< 20.15
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 20.15
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 4.03
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 20.15

TVVOC, Total very volatile organic compounds	Concentration after 3 days [µg/m³]	SER_{in} [µg/(u · h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	< 5	< 20.15
Sum of VVOC according to eco-INSTITUT-Label	3	12

*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]	SER _n [µg/(u · h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	16	64
VOC without LCI according to eco-INSTITUT-Label (Sum)	16	64
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)	3	12
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	3	12
Bicyclic Terpenes (sum)	< 1	< 4.03
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 4.03
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	2	8.1
C9 - C15 Alkylated benzenes (Sum)	< 1	< 4.03
Cresols (Sum)	< 1	< 4.03

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.05
R-value according to AgBB 2018 / DIBt	0.01
R-value according to Belgian regulation	0.01
R-value according to AFSSET	0.03

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 28 days

Test objective:

Volatile Organic Compounds (VOC), test chamber, air sampling 28 days after test chamber loading

Test result:

Sample: A001: SMART Bürodrehstuhl

No.	Substance	CAS No.	RT [min]	Concentration+	Toluene-equivalent	CMR Classifi- cation++	LCI	R-value
				Substances ≥ 1 µg/m³ [µg/m³]	Substances ≥ 5 µg/m³ [µg/m³]		AgBB 2018 [µg/m³]	
5	Aromatic alcohols							
5-2	BHT (2,6-di-tert-butyl-4-methylphenol)	128-37-0	24	1		Group 3	100	0.01
9	Acids							
9-1	Acetic acid	64-19-7	4.72	8			1200	0.01
13	Other identified substances in addition to LCI list							
	Triethylendiamine m/z 42 55 112*		13.93	7	7			

+ 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 28 days [µg/m³]	SER _u [µg/(u · h)]
CMR 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EC) No. 1272/2008: Category Carc. 1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B; TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B; IARC: Group 1 and 2A; DFG (MAK list): Categories III1, III2 (Sum)	< 1	< 4.03
C 1: VOC (incl. VVOC and SVOC) with the following categorisations: Regulation (EG) Nr. 1272/2008: Category Carc. 1A u. 1B (Sum)	< 1	< 4.03

TVOC, Total volatile organic compounds	Concentration after 28 days [µg/m³]	SER _u [µg/(u · h)]
Sum of VOC according to DIN EN 16516	7	28
Sum of VOC according to AgBB 2018 / DIBt	15	60
Sum of VOC according to eco-INSTITUT-Label	16	64
Sum of VOC according to ISO 16000-6	33	130

TSVOC, Total semi volatile organic compounds	Concentration after 28 days [µg/m³]	SER _u [µg/(u · h)]
Sum of SVOC according to DIN EN 16516	< 5	< 20.15
Sum of SVOC without LCI according to AgBB 2018 / DIBt	< 5	< 20.15
Sum of SVOC without LCI according to eco-INSTITUT-Label	< 1	< 4.03
Sum of SVOC with LCI according to AgBB 2018 / DIBt	< 5	< 20.15

TVVOC, Total very volatile organic compounds	Concentration after 28 days [µg/m³]	SER _u [µg/(u · h)]
Sum of VVOC according to AgBB 2018 / DIBt and Belgian regulation	< 5	< 20.15
Sum of VVOC according to eco-INSTITUT-Label	< 1	< 4.03

*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 28 days [µg/m³]	SER _n [µg/(u · h)]
VOC without LCI according to AgBB/DIBt and Belgian regulation (Sum)	7	28
VOC without LCI according to eco-INSTITUT-Label (Sum)	7	28
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)	< 1	< 4.03
Sensitising compounds with the following categorisations: DFG (MAK list): Category IV, German Federal Institute for Risk Assessment lists: Cat A, TRGS 907 (Sum)	< 1	< 4.03
Bicyclic Terpenes (Sum)	< 1	< 4.03
C9 - C14: Alkanes / Isoalkanes as dekane-equivalent (Sum)	< 1	< 4.03
C4 - C11 Aldehydes, acyclic, aliphatic (Sum)	< 2	< 8.06
C9 - C15 Alkylated benzenes (Sum)	< 1	< 4.03
Cresols (Sum)	< 1	< 4.03

Risk value for assessment of LCI	R-value
R-value according to eco-INSTITUT-Label	0.02
R-value according to AgBB 2018 / DIBt	0.01
R-value according to Belgian regulation	0.01
R-value according to AFSSET	0.03

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.

2 Odour, test chamber according to RAL-GZ 430

Test parameter:
Odour

Test method:

Analytics:	RAL-GZ 430, directly from the test chamber The team of qualified testers (at least 7 people, including at least 3 women) will spend at least 10 minutes in a room with clean air before carrying out the assessment. The odour test takes place undiluted. The senses of the test team should not become biased in connection with the odours to be evaluated.
Preparation of test specimen:	see 1 Emission analysis
Grading:	1 odourless 2 faint odour 3 clear, not bothering odour 4 bothering odour 5 intolerable odour

Test result:

Sample	Measurement time: [days]	Intensity of odour [Grade]
A001: SMART Bürodrehstuhl	14	1.6

Cologne, 07.09.2020



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



Appendix

Sampling sheet



Probenahmebegleitblatt

55457-001

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

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

Auftraggeber * PAPAPANAGIOTOU AVEEA - DROMEAS SA 62121 SERRES-GREECE TEL.: +30-23210-99220		Prüflabor eco-INSTITUT Germany GmbH Schanzenstr. 6-20, D-51063 Köln Tel. +49 (0)221 - 931245-0 Fax +49 (0)221 - 931245-33	
Name des Herstellers Name des Händlers (wenn abweichend vom Auftraggeber)		Probennehmer * KONSTANTINOS PAPAPANAGIOTOU (Name, Firma, Telefon) (Siehe Auftraggeber)	
		Probenahmeort * Produktionsstätte Auftraggeber	
Prüfstück- / Artikelbezeichnung * SMART Bürodrehstuhl		Probeart (z.B. Holzwerkstoff, Bodenbelag) Chargen-Nr. *	
Artikel-Nr. 987-407-433			
Modell / Programm / Serie SMART		Produktionsdatum der Charge * 10/07/2020 (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 * 10/07/2020 (dd/mm/yyyy)	
Lagerort: SERRES		Wie wurde das Produkt vor Probenahme gelagert? <input type="checkbox"/> offen <input checked="" type="checkbox"/> verpackt	
		Verpackungsmaterial: KARTON	
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.		PAPANAGIOTOU S.A. DROMEAS S.A. OFFICE FURNITURE INDUSTRY INDUSTRIAL ZONE 121 SERRES - GREECE TEL 00302321099220 FAX 00302321099270 V.A. No. TEL 09-10-478	
Datum (dd/mm/yyyy): 14/07/2020		Unterschrift/Stempel:	

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-Phenylcyclohexane
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
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

Propylenglycol (1,2-Dihydroxypropane)
Ethleneglycol (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)
Ethylidiglycol
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-butanal
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
 Tetradecamethylcycoheptasiloxane
 Tetrahydrofuran (THF)
 1-Octene
 1-Decene
 1-Dodecene
 2-Pentylfuran
 2-Methylfuran
 Isophorone
 Tetramethyl succinonitrile
 Dimethylformamide (DMF)
 Tributyl phosphate
 N-Ethyl-2-pyrrolidone
 Aniline
 4-Vinylcyclohexene
 Dichlormethane
 Carbon tetrachloride
 Chlorobenzene
 Chloroform
 Chloroprene (monomer)
 Acetamide
 Formamide
 1,3-Dichlor-2-propanol
 Cyclohexylisocyanate
 Butyl methacrylate
 2-Hexanone
 Azobis[isobutyronitrile]
 Benzophenone
 1-Buthyl-2-pyrrolidone
 Acroleine
 Furfuryl alcohol
 Decahydronaphthalene

1 VVOC

2 SVOC

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

Definition of terms

VOC (volatile organic compounds)	All individual compounds with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ 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 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 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.

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. As far as feasible, identification and quantification limit of any substance shall be 1 µg per m³ for substances adsorbed on Tenax and 2 µg/m³ 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 17025:2018-03. 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.

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

- 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.