

INFORME DE

ENSAYO Nº: 114445-1

CLIENTE: INDUSTRIAS JUNO S.A.

PERSONA DE CONTACTO: Luis Gil

DIRECCIÓN: Bº Saconi, 10
48950 Erandio (Bizkaia)

OBJETO: Emisión de VOCs, clasificación según legislación francesa de VOC

MUESTRA ENSAYADA: Muestra Ref. «Junoprof» que representa a la siguiente gama:

- «Bikril Mate»
- «A-5000»
- «Junoral B-5»
- «Junoral N-5»
- «G-200»
- «Castor N»
- «J-25»
- «J-28»
- «TotalCover»
- «Radiance»
- «Junoprof»

FECHA DE RECEPCION: 17.07.2024

FECHAS DE ENSAYO: 01.08.2024 a 24.10.2024

FECHA DE EMISIÓN: 13.11.2024



Blanca Ruiz de Gauna
Jefe Laboratorio de Materiales de
Construcción
Unidad Lab Services

* Los resultados del presente informe conciernen, única y exclusivamente al material ensayado.

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⁽¹⁾ Información aportada por el cliente. TecNALIA no se hace responsable de la información aportada por el cliente y esta información no está cubierta por la acreditación.



CARACTERISTICAS DE LAS MUESTRAS

Con fecha 17.07.2024 se recibió en Fundación Tecnalía R&I por parte de la empresa **“INDUSTRIAS JUNO S.A.”** una muestra referenciada como⁽¹⁾:

- «Junoprof» que representa a la siguiente gama:
 - «Bikril Mate»
 - «A-5000»
 - «Junoral B-5»
 - «Junoral N-5»
 - «G-200»
 - «Castor N»
 - «J-25»
 - «J-28»
 - «TotalCover»
 - «Radiance»
 - «Junoprof»

ENSAYOS SOLICITADOS

Los ensayos solicitados son los siguientes:

- ♦ Ensayo de emisión de VOC's (Compuestos orgánicos volátiles) según la norma EN 16516:2017 para establecer una clasificación según los criterios establecidos en el decreto Nº 2011-321 del 23 de marzo de 2011 del Ministerio Francés de Ecología, Desarrollo Sostenible, Transporte y Vivienda. Los ensayos se han realizado en el laboratorio acreditado “eco-INSTITUT” cuyo informe original se adjunta como Anexo I.





ENSAYOS REALIZADOS

El ensayo se ha realizado en una cámara con las siguientes condiciones:

- Condiciones de la cámara de ensayo según la norma ISO 16000-9:2008
 - Volumen: 0.125m³
 - Temperatura y humedad relativa: 23°C al 50% HR.
 - Presión: atmosférica
 - Renovación del aire: 0,5 h⁻¹

La determinación de las emisiones de VOC's para establecer una clasificación según los criterios establecidos en el decreto N° 2011-321 del 23 de marzo de 2011 del Ministerio Francés de Ecología, Desarrollo Sostenible, Transporte y Vivienda, se ha desarrollado según indican las normas ISO 16000-3:2013 e ISO 16000-6:2012. La preparación de las probetas de ensayo se ha realizado según la norma ISO 16000-11:2006 y un periodo de acondicionamiento fuera de la cámara de ensayo de 72 horas.

El límite de detección de las técnicas empleadas es de 1 µg/m³.



RESULTADOS

Los resultados obtenidos y los valores de referencia establecidos en el decreto Nº 2011-321 del 23 de marzo de 2011 del Ministerio Francés de Ecología, Desarrollo Sostenible, Transporte y Vivienda se muestran en la tabla I:

Tabla I – Regulación VOC

Ref.: «Junoprof» que representa a la siguiente gama:	Concentración (aire en la cámara de ensayo) [µg/m³] tras 28 días	Clases			
– «Bikril Mate» – «A-5000» – «Junoral B-5» – «Junoral N-5» – «G-200» – «Castor N» – «J-25» – «J-28» – «TotalCover» – «Radiance» – «Junoprof»					
Sustancias (Análisis de emisiones)		A+	A	B	C
Formaldehído	6	<10	<60	<120	>120
Acetaldehído	<2	<200	<300	<400	>400
Tolueno	<1	<300	<450	<600	>600
Tetracloroetileno	<1	<250	<350	<500	>500
Xileno	<1	<200	<300	<400	>400
1,2,4-Trimetilbenceno	<1	<1000	<1500	<2000	>2000
1,4-Diclorobenceno	<1	<60	<90	<120	>120
Etilbenceno	<1	<750	<1000	<1500	>1500
2-Butoxyetanol	<1	<1000	<1500	<2000	>2000
Estireno	<1	<250	<350	<500	>500
TVOC	30	<1000	<1500	<2000	>2000



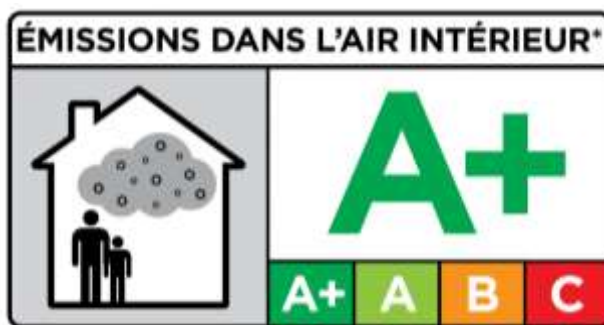


CONCLUSIONES

El producto denominado «**Junoprof**» que representa a la siguiente gama:

- «Bikril Mate»
- «A-5000»
- «Junoral B-5»
- «Junoral N-5»
- «G-200»
- «Castor N»
- «J-25»
- «J-28»
- «TotalCover»
- «Radiance»
- «Junoprof»

cumple los requisitos de la Clase A+ del decreto N° 2011-321 del 23 de marzo de 2011 del Ministerio Francés de Ecología, Desarrollo Sostenible, Transporte y Vivienda. Por lo tanto, en base a los resultados obtenidos, el producto queda clasificado con el siguiente distintivo correspondiente a la clasificación A+ según la legislación mencionada:



ANEXO I

**Informe laboratorio colaborador con
Tecnalia**

Tecnalia Research & Innovation
Mikeletegi Pasealekua, 2
20009 Donostia - San Sebastian
Spain

Test Report No. 59444-A001-FV0-L II

Test objective:

Evaluation according to French VOC-regulation

Article designation according to order:

Junoprof
tested as a representative for:

- Bikril Mate
- A-5000
- Junoral B-5
- Junoral N-5
- G-200
- Castor N
- J-25
- J-28
- TotalCover
- Radiance

Date of report:

24/10/2024

Number of pages of report:

15

Testing / responsible laboratory:

eco-INSTITUT Germany GmbH, Köln

Test objective fulfilled:



Class A+

Note:

The test results in the report refer exclusively to the test sample submitted by the manufacturer. The report is not permitted to be used in product and company advertising. The report may be published in full as technical documentation on the Internet with the written consent of eco-INSTITUT Germany GmbH. eco-INSTITUT Germany GmbH has recommended that the manufacturer repeats the test after 3 years at the latest. Further information at www.eco-institut.de/en/advertising



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Sample View

Internal sample number (filled in by laboratory)

59444-A001

Photo of the test specimen: A001



Article designation according to order:

Junoprof

Sample/batch number according to order:

no information

Type of sample:

Interior. For all types of wall surfaces, especially in smooth finishes. Masonry surfaces. Highly decorative finishes. Do-it-yourself in general.

Date of production:

no information

Sampling by:

INDUSTRIAS JUNO, S.A. C/ Saconi 10, 48950 Erandio Bizkaia, España

Date of sampling:

17/07/2024

Location of sampling:

INDUSTRIAS JUNO, S.A. C/ Saconi 10, 48950 Erandio Bizkaia, España

Receipt of sample / Condition upon delivery:

08/08/2024 / without objection

Statement of conformity with VOC-regulation

The sample with the internal sample number 59444-A001 has been tested on behalf of **Tecnalia Research & Innovation**. The article description according to the order is **Junoprof**.

This evaluation bases on the test criteria of the decree no. 2011-321 of 23rd March 2011 (VOC regulation) of the French Ministry of Ecology, Sustainable Development, Transport and Housing.

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

VOC regulation

Emission analysis	Concentration (Test chamber air) [µg/m³]	Class			
Substance	after 28 days	C	B	A	A+
Formaldehyde	6	> 120	< 120	< 60	< 10
Acetaldehyde	< 2	> 400	< 400	< 300	< 200
Toluene	< 1	> 600	< 600	< 450	< 300
Tetrachlorethylene	< 1	> 500	< 500	< 350	< 250
Xylene	< 1	> 400	< 400	< 300	< 200
1,2,4-Trimethylbenzene	< 1	> 2000	< 2000	< 1500	< 1000
1,4-Dichlorbenzene	< 1	> 120	< 120	< 90	< 60
Ethylbenzene	< 1	> 1500	< 1500	< 1000	< 750
2-Butoxyethanol	< 1	> 2000	< 2000	< 1500	< 1000
Styrene	< 1	> 500	< 500	< 350	< 250
TVOC _{tot}	30	> 2000	< 2000	< 1500	< 1000

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 $\geq 50\%$. Similarly, a result slightly below the specification value also only has a probability of $\geq 50\%$ 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/).



Summary statement of conformity with VOC-regulation

The sample with the internal sample number 59444-A001, article description according to order: **Junoprof**, meets the requirements of the **Class A+** of the decree no. 2011-321 of 23rd March 2011 (VOC regulation) of the French Ministry of Ecology, Sustainable Development, Transport and Housing.

Cologne, 24/10/2024

A handwritten signature in black ink, appearing to read "M.A. Dobaj".

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

Déclaration de conformité avec les critères du COV décret

L'échantillon avec le numéro d'échantillon interne 59444-A001 a été testé sous la responsabilité du **Tecnalia Research & Innovation**. La description de l'article selon la commande est **Junoprof**.

Cette évaluation est basée sur les critères du décret n° 2011-321 du 23 mars 2011 (COV décret) par le Ministère de l'écologie, du développement durable, des transports et du logement.

Les résultats documentés dans le rapport du test sont évalués comme suit.²

COV décret

Analyse des émissions	Concentration (air de la chambre d'essai) [µg/m³]	Classe			
Substance	au bout de 28 jours	C	B	A	A+
Formaldéhyde	6	> 120	< 120	< 60	< 10
Acétaldéhyde	< 2	> 400	< 400	< 300	< 200
Toluène	< 1	> 600	< 600	< 450	< 300
Tétrachloréthylène	< 1	> 500	< 500	< 350	< 250
Xylène	< 1	> 400	< 400	< 300	< 200
1,2,4-Triméthylbenzène	< 1	> 2000	< 2000	< 1500	< 1000
1,4-Dichlorobenzène	< 1	> 120	< 120	< 90	< 60
Ethylbenzène	< 1	> 1500	< 1500	< 1000	< 750
2-Butoxyéthanol	< 1	> 2000	< 2000	< 1500	< 1000
Styrène	< 1	> 500	< 500	< 350	< 250
COV_{tot}	30	> 2000	< 2000	< 1500	< 1000

² Si un résultat de mesure dépasse légèrement les exigences et est évalué "non conforme", cette évaluation se base sur l'accord du "risque partagé d'incertitude de mesure (Shared Risk-Ansatz)". La probabilité que la déclaration soit correcte est ensuite $\geq 50\%$. De même, un résultat légèrement inférieur à la valeur requise n'est conforme qu'avec une probabilité de $\geq 50\%$. Cela signifie que le risque de faire une fausse déclaration négative pour satisfaire à l'exigence est aussi élevé que le risque de faire une fausse déclaration positive (plus d'informations sur https://www.eco-nstitut.de/en/2019/07/measurement_uncertainty/).

Résumé de la déclaration de conformité

L'échantillon avec le numéro d'échantillon interne 59444-A001, description de l'article selon la commande: **Junoprof**, correspond aux exigences de la **classification A+** sur les critères du décret n° 2011-321 du 23 mars 2011 (COV décret) par le Ministère de l'écologie, du développement durable, des transports et du logement.

Cologne, 24/10/2024

A handwritten signature in black ink, appearing to read "M.A. Dobaj".

Marc-Anton Dobaj, M.Sc. Crystalline Materials
(direction du projet)

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 specimen

Date:

10/09/2024

Test specimen preparation:

Application on glass with a brush; application quantity 147 g/m²;
drying / pre-conditioning outside of the test chamber for 72 hours

Masking of backside:

not applicable

Masking of edges:

not applicable

Relationship of unmasked
edges to surface:

not applicable

Loading reference unit:

area-specific [m²]

Dimensions:

2 x 25.0 cm x 25.0 cm with each 9.2 g

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

Chamber volume:

0.125 m³

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:

1.0 m²/m³

Specific air flow rate:

0.5 m³/(m²·h)

Starting time of the test (t₀):

13/09/2024

Air sampling:

28 days after test chamber loading

Analytcs

Aldehydes and ketones:

DIN ISO 16000-3:2023-12

Limit of quantification:

2 µg/m³

Volatile organic compounds:

DIN ISO 16000-6:2022-03

Limit of quantification:

1 µg/m³ (1,4-Cyclohexanedimethanol, Diethylene glycol,
1,4-Butanediol: 5 µg/m³)

Note for analysis:

not specified

1.1 Sample A001, Volatile organic compounds after 28 days

Test objective:

Volatile organic compounds according to „Arrêté du 19 avril 2011 relatif à l'étiquetage des produits de construction ou de revêtement de mur ou de sol et des peintures et vernis sur leurs émissions de polluants volatils“ (french VOC-regulation, 10 substances), test chamber, air sampling 28 days after test chamber loading

Test result:

Internal sample number: | 59444-A001

	Substance	CAS No.	RT [min]	Concentration+ (test chamber air) substances $\geq 1 \mu\text{g}/\text{m}^3$ after 28 days DNPH $\geq 2 \mu\text{g}/\text{m}^3$ after 28 days [$\mu\text{g}/\text{m}^3$]	Toluene- equivalent substances $\geq 5 \mu\text{g}/\text{m}^3$ after 28 days [$\mu\text{g}/\text{m}^3$]
	Aromatic hydrocarbons				
VOC	Toluene	108-88-3		< 1	< 5
VOC	Ethylbenzene	100-41-4		< 1	< 5
VOC	Xylene, mix of o-, m- and p-Xylene isomers	1330-20-7		< 1	< 5
VOC	p-Xylene (including m-Xylol)	106-42-3		< 1	< 5
VOC	o-Xylene	95-47-6		< 1	< 5
VOC	1,2,4-Trimethylbenzene	95-63-6		< 1	< 5
VOC	Styrene	100-42-5		< 1	< 5
	Glycols, Glycol ethers, Glycol esters				
VOC	Ethylene glycol monobutyl ether (2-Butoxyethanol)	111-76-2		< 1	< 5
	Aldehydes				
VVOC	Acetaldehyde	75-07-0		< 2	n. d.
VVOC	Formaldehyde	50-00-0		6	n. d.
	Other identified substances in addition to LCI list				
VOC	Benzene	71-43-2		< 1	< 5
VOC	1,4-Dichlorobenzene	106-46-7		< 1	< 5
VOC	Trichloroethene	79-01-6		< 1	< 5
VOC	Tetrachloroethene	127-18-4		< 1	< 5

+ identified and calibrated substances, substance specific calculated
 n.d. = not determinable

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TVOC, Total volatile organic compounds	Concentration after 28 days [µg/m³]	SERa [µg/(m² · h)]
Sum of VOC according to DIN ISO 16000-6	30	15

Cologne, 24/10/2024

A handwritten signature in black ink that reads 'm. Stein'.

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

Appendix

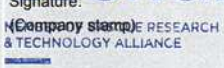
Sampling sheet

Produktprüfung Product testing
 Zertifizierung Certification
 Beratung Consulting

eco
 INSTITUT

Sampling Sheet*

59444-001

Testing laboratory	eco-INSTITUT Germany GmbH Schanzenstr. 6-20, D-51063 Cologne Germany Tel. +49 (0)221 - 931245-0 Fax +49 (0)221 - 931245-33	Sampler (Name, Company, Phone number)	Same as manufacturer.
Name of manufacturer / distributor at place of sampling (Address / Stamp)	INDUSTRIAS JUNO, S.A. C/ Saconi 10 48950 ERANDIO BIZKAIA ESPAÑA	Customer/ Invoice recipient (if different from manufacturer)	TECNALIA CIF: G48975767 Parque Científico y Tecnológico de Bizkaia C/Geldo, Edificio 700 E-48160 Derio (Bizkaia) Spain
Product name	Junoprof	Product type (e.g. parquet, floor covering)	Interior. For all types of wall surfaces, especially in smooth finishes. Masonry surfaces. Highly decorative finishes. Do-it-yourself in general.
Model / programme / series	--	Batch	--
Article number	--	Production date of batch	--
Samples are taken from	☐ current production ☒ storage	Sampling date	17.07.24
Storage location before sampling	☐ in production ☒ storage ☐ other	Storage conditions before sampling	☐ open ☒ packaged
Storage location:	Manufacturer location	Packaging material:	Plastic
Special features (possible negative effects through emissions at place of sampling (e.g. benzine, exhaust fumes), unclarties, questions etc.)		Application rate 147g/m2	
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: 01.08.24 Signature:  			
Order		Reference from Tecnaia: 114445	
(Please insert quote number, or - if not available, please enter the desired analysis)		Test required: 05357+05365+02181+02183 official order: SPC24-07595	

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

eco-INSTITUT Germany GmbH / Schanzenstrasse 6-20 / Carlswerk Kupferzug 5.2 / D-51063 Köln / Germany
 Tel. +49 221 931245-0 / Fax +49 221 931245-33 / eco-institut.de / Geschäftsführer: Dr. Frank Kuebart
 HRB: 17917 / USt-ID: DE 122653308 / Raiffeisenbank Frechen-Hurth, IBAN: DE60370623651701900010, BIC: GENODE33HAN

 **DAKKS**
 Deutsche
 Akkreditierungsstelle
 DIN EN ISO/IEC 17025

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Definition of terms

CAS No. (Chemical Abstracts Service)	International designation standard for chemical substances
CMR	VOCs, VVOCs and SVOCs classified as carcinogenic, mutagenic or toxic for reproduction according to Regulation (EC) No. 1272/2008, TRGS 905, IARC list and DFG (MAK list)
Limit of quantification (LOQ)	Lower limit of quantification in the analytical method within the defined measurement uncertainty
NIK / LCI	Lowest concentration of interest; substance-specific value for health assessment of emissions from products, indicated in $\mu\text{g}/\text{m}^3$
RT (retention time)	Total time required for an analyte to pass the column (time between injection and detection of the analyte)
R value	Sum of quotients of concentration and LCI value for all substances for which a LCI value is derived
R value according to AgBB	R-value for all substances $\geq 5 \mu\text{g}/\text{m}^3$ with LCI value, calculated according to the LCI list of the AgBB scheme
R-value according to Belgian regulation	R-value for all substances $\geq 5 \mu\text{g}/\text{m}^3$ with LCI-value, calculated according to the LCI-list of the Belgian regulation
R value according to eco-INSTITUT-Label	R-value for all substances $\geq 1 \mu\text{g}/\text{m}^3$ with LCI value, calculated according to the LCI list of the AgBB scheme
R value according to EU-LCI	R-value for all substances $\geq 5 \mu\text{g}/\text{m}^3$ with EU-LCI value, calculated according to the EU-LCI list of the European Commission
SER	Specific emission rate (see "Explanation of Specific Emission Rate SER")
SVOC (semi volatile organic compound)	Organic compound eluting in the retention range $> C_{16}$ (n-hexadecane) to C_{22} (docosane)
Toluene equivalent	Concentration of a substance quantified by the TIC response factor of toluene (calculation of the concentration by comparing the integral of the substance with the integral of toluene)
TSVOC	Sum of the concentrations of all identified and unidentified semi volatile organic compounds eluting in the retention range $> C_{16}$ (n-hexadecane) to C_{22} (docosane)
TSVOC according to DIN EN 16516	Sum of all SVOC $\geq 5 \mu\text{g}/\text{m}^3$ (as toluene equivalent)
TSVOC with LCI according to AgBB	Sum of all SVOC with LCI $\geq 5 \mu\text{g}/\text{m}^3$ (quantified substance-specific)
TSVOC with LCI according to eco-INSTITUT-Label	Sum of all SVOC with LCI $\geq 1 \mu\text{g}/\text{m}^3$ (quantified substance-specific)
TSVOC without LCI according to AgBB	Sum of all SVOC without LCI $\geq 5 \mu\text{g}/\text{m}^3$ (as toluene equivalent)
TSVOC without LCI according to eco-INSTITUT label	Sum of all calibrated SVOC without LCI $\geq 1 \mu\text{g}/\text{m}^3$ (quantified substance-specific) and all non-calibrated SVOC without LCI $\geq 1 \mu\text{g}/\text{m}^3$ (as toluene equivalent)
TVOC	Sum of the concentrations of all identified and unidentified volatile organic compounds eluting in the retention range from C_6 (n-hexane) to C_{16} (n-hexadecane)

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TVOC according to DIN EN 16516	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 (used i.a. for M1)
TVOC according to AgBB	Sum of all VOCs with LCI $\geq 5 \mu\text{g}/\text{m}^3$ (quantified substance-specific) and all VOCs without LCI $\geq 5 \mu\text{g}/\text{m}^3$ (as toluene equivalent) (used i.a. for the Blue Angel)
TVOC according to eco-INSTITUT-Label	Sum of all calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ (quantified substance-specific) and all non-calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ (as toluene equivalent) (used i.a. for natureplus)
TVOC according to ISO 16000-6	Total area of the chromatogram in the retention range $C_6 - C_{16}$ as toluene equivalent according to DIN ISO 16000-6, Annex A.1 item 3 (used i.a. for CDPH, BIFMA and the French VOC regulation)
TVOC without LCI according to AgBB	Sum of all VOCs without LCI $\geq 5 \mu\text{g}/\text{m}^3$ as toluene equivalent
TVOC without LCI according to eco-INSTITUT-Label	Sum of all calibrated VOCs without LCI $\geq 1 \mu\text{g}/\text{m}^3$ (quantified substance-specific) and all non-calibrated VOCs without LCI $\geq 1 \mu\text{g}/\text{m}^3$ (as toluene equivalent)
TVVOC	Sum of the concentrations of all identified and unidentified very volatile organic compounds eluting in the retention range $< C_6$ (n-hexane)
TVVOC according to AgBB	Sum of all VVOC with LCI $\geq 5 \mu\text{g}/\text{m}^3$ (quantified substance-specific) and all VVOC without LCI $\geq 5 \mu\text{g}/\text{m}^3$ (as toluene equivalent)
TVVOC according to eco-INSTITUT-Label	Sum of all calibrated VVOC $\geq 1 \mu\text{g}/\text{m}^3$ (substance-specific quantified) and all non-calibrated VVOC $\geq 1 \mu\text{g}/\text{m}^3$ (as toluene equivalent)
VOC (volatile organic compound)	Organic compound eluting in the retention range from C_6 (n-hexane) to C_{16} (n-hexadecane)
VVOC (very volatile organic compound)	Organic compound eluting in the retention range $< C_6$ (n-hexane)

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. Standardised 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 derivatised with DNPH for the determination of formaldehyde and other short-chain carbonyl compounds ($C_1 - C_6$) are analysed using high-performance liquid chromatography (HPLC).

Over 200 compounds, including volatile organic compounds ($C_6 - C_{16}$), semi-volatile organic compounds ($C_{16} - C_{22}$) and – insofar as possible with this method – also very volatile organic compounds (less than C_6) are determined and quantified individually.

All other substances – insofar as 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.

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

- 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.