



## INFORME No.: 102898-5 (M1)

<b>CLIENTE:</b>	DERIVADOS ASFÁLTICOS NORMALIZADOS, S.A.
<b>PERSONA DE CONTACTO:</b>	Laura Zahonero García
<b>DIRECCIÓN:</b>	Polígono Industrial Sector 9 19290 FONTANAR (Guadalajara)
<b>OBJETO:</b>	Emisión de VOCs, clasificación según legislación francesa de VOC
<b>MUESTRA ENSAYADA:</b>	Muestra Ref. «DANOPREN PR-P-80 (482007)» Ensayado en representación de productos idénticos de menor grosor
<b>FECHA DE RECEPCION:</b>	02.01.2023
<b>FECHAS DE ENSAYO:</b>	24.01.2023 a 28.02.2023
<b>FECHA DE EMISIÓN:</b>	06.03.2023
<b>FECHA DE EMISIÓN (M1):</b>	18.05.2023



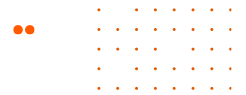
Blanca Ruiz de Gauna  
Jefe Laboratorio de Materiales de  
Construcción  
Unidad Lab Services

\* Este informe anula y sustituye al informe 102898-5. El motivo de dicha modificación es que se añade una nota aclaratoria.

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<sup>(1)</sup> Información aportada por el cliente. FUNDACIÓN TECNALIA R&I no se hace responsable de la información aportada por el cliente.



## CARACTERISTICAS DE LAS MUESTRAS

Con fecha 02.01.2023 se recibió en Fundación Tecnalia R&I por parte de la empresa **“DERIVADOS ASFÁLTICOS NORMALIZADOS, S.A.”** una muestra referenciada como<sup>(1)</sup>:

- «DANOPREN PR-P-80 (482007)», lote: 2210131211  
Ensayado en representación de productos idénticos de menor grosor

## 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-STITUT” 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: 0.125m<sup>3</sup>
  - Temperatura y humedad relativa: 23°C al 50% HR.
  - Presión: atmosférica
  - Renovación del aire: 0,5 h<sup>-1</sup>

La determinación de las emisiones de VOC's 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, 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/m<sup>3</sup>.



## RESULTADOS

Los resultados obtenidos y los valores de referencia establecidos en el decreto N° 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.: «DANOPREN PR-P-80 (482007)» Ensayado en representación de productos idénticos de menor grosor	Concentración (aire en la cámara de ensayo) [ $\mu\text{g}/\text{m}^3$ ] tras 28 días	Clases			
		A+	A	B	C
Sustancias (Análisis de emisiones)					
Formaldehído	<2	<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	2	<250	<350	<500	>500
<b>TVOC</b>	<b>22</b>	<b>&lt;1000</b>	<b>&lt;1500</b>	<b>&lt;2000</b>	<b>&gt;2000</b>



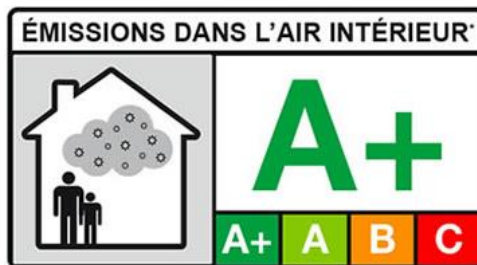


## CONCLUSIONES

El producto denominado:

- **«DANOPREN PR-P-80 (482007)»**  
**Ensayado en representación de productos idénticos de menor grosor**

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**

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

## Test Report No. 57965-A001-FV0-L

Test objective:	Evaluation according to French VOC-regulation
Article designation according to order:	DANOPREN PR-P-80 (482007), LOTE: 2210131211 Tested as a representative for identical products with lower thickness
Date of report:	28/02/2023
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 <a href="http://www.eco-institut.de/en/advertising">www.eco-institut.de/en/advertising</a>



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‡ subcontracted, # outside accreditation

## Sample View

**Internal sample number (filled in by laboratory)**

57965-A001

Photo of the test sample:

A001



Article designation according to order:

DANOPREN PR-P-80 (482007), LOTE: 2210131211

Sample/batch number according to order:

no information

Type of sample:

Thermal insulation for flat roofs, both conventional and inverted.  
Thermal insulation for residential and commercial floors with overloads.

Date of production:

no information

Sampling by:

DERIVADOS ASFALTICOS NORMALIZADOS SA-DANOSA, Pol. Ind.  
Sector 9, 19290 Fontanar, Guadalajara, España

Date of sampling:

02/01/2023

Location of sampling:

DERIVADOS ASFALTICOS NORMALIZADOS SA-DANOSA, Pol. Ind.  
Sector 9, 19290 Fontanar, Guadalajara, España

Receipt of sample / Condition upon delivery:

05/01/2023 / without objection





## Statement of conformity with VOC-regulation

The sample with the internal sample number 57965-A001 has been tested on behalf of **Tecnia Research & Innovation**. The article description according to the order is **DANOPREN PR-P-80 (482007), LOTE: 2210131211**.

This evaluation bases on the test criteria of the decree no. 2011-321 of 23<sup>rd</sup> 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.<sup>1</sup>

### VOC regulation

Emission analysis	Concentration (Test chamber air) [µg/m <sup>3</sup> ]	Class			
		after 28 days	C	B	A
Formaldehyde	< 2	> 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	2	> 500	< 500	< 350	< 250
<b>TVOC<sub>tot</sub></b>	22	<b>&gt; 2000</b>	<b>&lt; 2000</b>	<b>&lt; 1500</b>	<b>&lt; 1000</b>

<sup>1</sup> 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/](https://www.eco-institut.de/en/2019/07/measurement_uncertainty/)).

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## Summary statement of conformity with VOC-regulation

The sample with the internal sample number 57965-A001, article description according to order: **DANOPREN PR-P-80 (482007)**, **LOTE: 2210131211**, meets the requirements of the **Class A+** of the decree no. 2011-321 of 23<sup>rd</sup> March 2011 (VOC regulation) of the French Ministry of Ecology, Sustainable Development, Transport and Housing.

Cologne, 28/02/2023

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 57965-A001 a été testé sous la responsabilité du **Tecnalia Research & Innovation**. La description de l'article selon la commande est **DANOPREN PR-P-80 (482007), LOTE: 2210131211**.

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.<sup>2</sup>

### COV décret

Analyse des émissions	Concentration (air de la chambre d'essai) [µg/m <sup>3</sup> ]	Classe			
		C	B	A	A+
<b>Substance</b>	<b>au bout de 28 jours</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>A+</b>
Formaldéhyde	< 2	> 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	2	> 500	< 500	< 350	< 250
<b>COV<sub>tot</sub></b>	22	<b>&gt; 2000</b>	<b>&lt; 2000</b>	<b>&lt; 1500</b>	<b>&lt; 1000</b>

<sup>2</sup> 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/](https://www.eco-nstitut.de/en/2019/07/measurement_uncertainty/)).

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## Résumé de la déclaration de conformité

L'échantillon avec le numéro d'échantillon interne 57965-A001, description de l'article selon la commande: **DANOPREN PR-P-80 (482007)**, **LOTE: 2210131211**, 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, 28/02/2023

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 sample

Date: 24/01/2023  
Sample preparation: not applicable  
Masking of backside: yes  
Masking of edges: yes, 100 %  
Relationship of unmasked edges to surface: not applicable  
Loading reference unit: area-specific [m<sup>2</sup>]  
Dimensions: 25 cm x 20 cm [thickness: 80 mm]

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

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: 0.5 h<sup>-1</sup>  
Air velocity: 0.3 m/s  
Loading: 0.4 m<sup>2</sup>/m<sup>3</sup>  
Specific air flow rate: 1.25 m<sup>3</sup>/(m<sup>2</sup> · h)  
Starting time of the test (t<sub>0</sub>): 24/01/2023  
Air sampling: 28 days after test chamber loading

### Analytics

Aldehydes and ketones | DIN ISO 16000-3:2013-01  
Limit of quantification: 2 µg/m<sup>3</sup>  
Volatile organic compounds | DIN ISO 16000-6:2022-03  
Limit of quantification: 1 µg/m<sup>3</sup> (1,4-Cyclohexanedimethanol, Diethylene glycol,  
1,4-Butanediol: 5 µg/m<sup>3</sup>)  
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: 57965-A001

No.	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 [ $\mu\text{g}/\text{m}^3$ ]
<b>1</b>	<b>Aromatic hydrocarbons</b>				
1-1	Toluene	108-88-3		< 1	< 5
1-2	Ethylbenzene	100-41-4		< 1	< 5
1-3	Xylene, mix of o-, m- and p-Xylene isomers	1330-20-7		< 1	< 5
1-4	p-Xylene (including m-Xylol)	106-42-3		< 1	< 5
1-6	o-Xylene	95-47-6		< 1	< 5
1-11	1,2,4-Trimethylbenzene	95-63-6		< 1	< 5
1-25	Styrene	100-42-5	10.55	2	< 5
<b>6</b>	<b>Glycols, Glycol ethers, Glycol esters</b>				
6-3	Ethylene glycol monobutyl ether (2-Butoxyethanol)	111-76-2		< 1	< 5
<b>7</b>	<b>Aldehydes</b>				
7-20	Acetaldehyde	75-07-0		< 2	n. d.
7-22	Formaldehyde	50-00-0		< 2	n. d.
<b>13</b>	<b>Other identified substances in addition to LCI list</b>				
	Benzene	71-43-2		< 1	< 5
	1,4-Dichlorobenzene	106-46-7		< 1	< 5
	Trichloroethene	79-01-6		< 1	< 5
	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 [ $\mu\text{g}/\text{m}^3$ ]	SERa [ $\mu\text{g}/(\text{m}^2 \cdot \text{h})$ ]
Sum of VOC according to DIN ISO 16000-6	22	28

Cologne, 28/02/2023

A handwritten signature in black ink, appearing to read 'm. Stein', is positioned above the printed name.

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



# Appendix

## Sampling sheet

### Sampling Sheet\*

<b>Testing laboratory</b>	eco-INSTITUT Germany GmbH Schanzenstr. 6-20, D-51063 Cologne Germany Tel. +49 (0)221 - 931245-0 Fax +49 (0)221 - 931245-33	<b>Sampler</b> (Name, Company, Phone number)	Same as manufacturer.
<b>Name of manufacturer / distributor at place of sampling</b> (Address / Stamp)	DERIVADOS ASFALTICOS NORMALIZADOS SA-DANOSA Pol. Ind. Sector 9 19290 FONTANAR, GUADALAJARA, ESPAÑA	<b>Customer/ Invoice recipient</b> (if different from manufacturer)	TECNALIA CIF: G48975767 Parque Científico y Tecnológico de Bizkaia C/Geldo, Edificio 700 E-48160 Derio (Bizkaia) Spain
<b>Product name</b>	DANOPREN PR-P-80 (482007), LOTE: 2210131211	<b>Product type</b> (e.g. parquet, floor covering)	- Thermal insulation for flat roofs, both conventional and inverted. - Thermal insulation for residential and commercial floors with overloads.
<b>Model / programme / series</b>	--	<b>Batch</b>	--
<b>Article number</b>	--	<b>Production date of batch</b>	--
<b>Samples are taken from</b>	<input type="checkbox"/> current production <input checked="" type="checkbox"/> storage	<b>Sampling date</b>	02.01.23
<b>Storage location before sampling</b>	<input type="checkbox"/> in production <input checked="" type="checkbox"/> storage <input type="checkbox"/> other	<b>Storage conditions before sampling</b>	<input type="checkbox"/> open <input checked="" type="checkbox"/> packaged
	Storage location: Manufacturer location		Packaging material: Plastic
<b>Special features</b> (possible negative effects through emissions at place of sampling (e.g. benzine, exhaust fumes), unclarities, questions etc.)		<b>Application rate:</b>	
<b>Validation</b>			
Hereby the signer affirms the accuracy of the above-mentioned statements. The sample was chosen, sampled and packaged according to the sampling guidelines.			
Date: 03.01.23	Signature: (Company stamp)		
<b>Order</b> (Please insert quote number, or - if not available, please enter the desired analysis)		Reference from Tecnalia: 102898 Test required: 05357+02181+02183 official order: SPC23-00249 /	

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





## 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)
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")
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)
VOC (volatile organic compound)	Organic compound eluting in the retention range from C6 (n-hexane) to C16 (n-hexadecane)
TVOC	Sum of the concentrations of all identified and unidentified volatile organic compounds eluting in the retention range from C6 (n-hexane) to C16 (n-hexadecane)
TVOC according to DIN EN 16516	Sum of all VOC $\geq 5 \mu\text{g}/\text{m}^3$ in the retention range C6 to C16, 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 C6 - C16 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)
VVOC (very volatile organic compound)	Organic compound eluting in the retention range $< \text{C6}$ (n-hexane)

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TVOC	Sum of the concentrations of all identified and unidentified very volatile organic compounds eluting in the retention range < C6 (n-hexane)
TVOC 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)
TVOC 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)
SVOC (semi volatile organic compound)	Organic compound eluting in the retention range > C16 (n-hexadecane) to C22 (docosane)
TSVOC	Sum of the concentrations of all identified and unidentified semi volatile organic compounds eluting in the retention range > C16 (n-hexadecane) to C22 (docosane)
TSVOC according to DIN EN 16516	Sum of all SVOC $\geq 5 \mu\text{g}/\text{m}^3$ (as toluene equivalent)
TSVOC without LCI according to AgBB	Sum of all SVOC without LCI $\geq 5 \mu\text{g}/\text{m}^3$ (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 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)
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)

## Commentary on emission analysis

### Test method

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

Air samples are taken from the test chamber at defined points in time during the continuously running test. To this end, approximately 5 L of air are collected from the test chamber at an air flow rate of 100 mL/min on Tenax and approx. 100 L at an air flow rate of 0.8 L/min on silica gel coated with DNPH (2,4-dinitrophenylhydrazine).

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

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

Over 200 compounds, including volatile organic compounds (C6 - C16), semi-volatile organic compounds (C16 - C22) and – insofar as possible with this method – also very volatile organic compounds (less than C6) are determined and quantified individually.

All other substances – insofar as is possible – are identified through comparison with a library of spectra. The quantification of these substances and non-identified substances is performed through a comparison of their signal area with the signal of toluene.

The determined substance concentrations are corrected using the recovery rate of the internal standard (toluene-d8). Identification and quantification of substances is carried out from a concentration (limit of quantification) of 1 µg per m<sup>3</sup> test chamber air or 2 µg/m<sup>3</sup> 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).

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## 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.

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