

Teknos Oy
P.O. Box 107
FI-00371 HELSINKI
FINLAND

Eurofins Expert Services Oy
Kivimiehentie 4
FI-02150 ESPOO
FINLAND

MaterialEmissions@cpt.eurofinseu.com
www.eurofins.fi/expertservices

EMISSION MEASUREMENTS

1 Sample Information

Sample name	BIORA 20 (NCS S 3560G)
Batch no.	409516-301
Production date	1.11.2023
Product type	Water-borne wall paint
Sample reception	5.9.2024

2 Brief Evaluation of the Results

2.1 Comparison with Nordic Swan Ecolabel Limit Values /1/

Parameter	Results	Limit Value
TVOC [mg/m ³]	0.011	≤ 0.3
Single CMR compounds [mg/m ³]	Complies	≤ 0.001
Formaldehyde [mg/m ³]	< 0.005	≤ 0.06

Full details based on the testing and direct comparison with limit values are available in the following pages.

Espoo, 31.10.2024



Hanna Kajander
Senior Expert

Distribution Customer

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3 Applied Test Methods

3.1 Specific Laboratory Sampling and Analyses

Procedure	External Method	Quantification limit / sampling volume	Analytical principle	Combined Uncertainty [RSD (%)]
Sample preparation	EN 16516 + A1 /2/ ISO 16000-11 /3/	-	-	-
Emission chamber testing	EN 16516 + A1 /2/, ISO 16000-9 /4/	-	Chamber and air control	-
Sampling of VOC	EN 16516 + A1 /2/, ISO 16000-6 /5/	1.5-5 L	Tenax TA	-
Analysis of VOC	EN 16516 + A1 /2/, ISO 16000-6 /5/	1 µg/m³	TD-GC/MS	±25%
Sampling of formaldehyde**	EN 16516 + A1 /2/, ISO 16000-3 /7/	50-100 L	DNPH cartridge	-
Analysis of formaldehyde**	EN 16516 + A1 /2/, ISO 16000-3 /7, 8/	1 µg/m³	Liquid chromatography/ UV	±23%

*) Not part of T001 accreditation

**) Not part of T001 accreditation, analysed at the Institute of Occupational Health, Accredited by FINAS T013

4 Sample Information and Preparation, Test Parameters and Deviations

4.1 Sample Information

Parameter	Value
Product type	wall paint
Product name	BIORA 20 (NCS S 3560G)
Batch number	409516-301
Production date	1.11.2023
Sampling date	23.8.2024
Sending date	-
Sample received	5.9.2024
Packaging / transport	metal can 0.9 L / by customer
Sample description	green liquid

4.2 Preparation of the Test Specimen

Paint was applied on glass plate with brush. Application amount was 142 g/m².

4.3 Test Period

Parameter	Value
Test specimen preparation, date	12.9.2024
Loading of chamber, date	12.9.2024
Emission sampling, date	10.10.2024
VOC analysis, dates	27.-31.10.2024
Formaldehyde analysis, dates	14.-16.10.2024

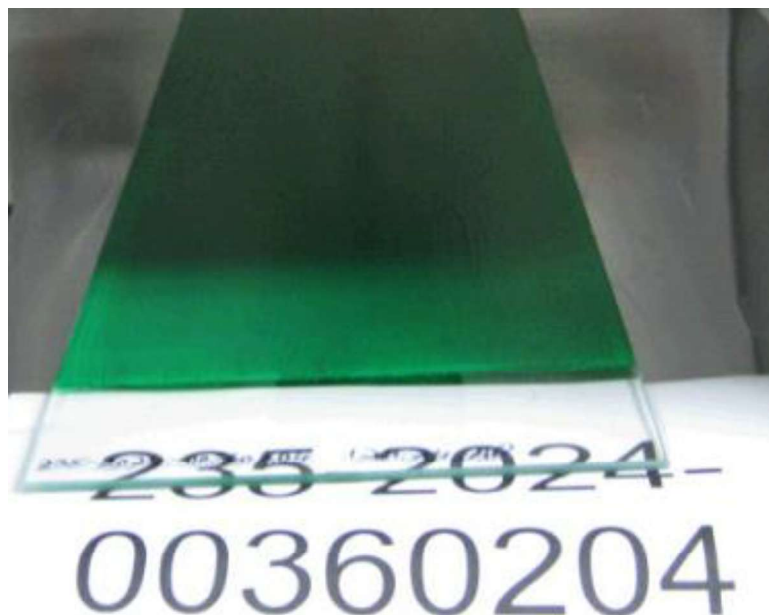
4.4 Emission Test Chamber Parameters during Ageing and Air Sampling

Parameter	Value	Parameter	Value
Chamber volume, V[m ³]	0.12	Test specimen area, [m ²]	0.12
Air Change rate, n[h ⁻¹]	0.5	Area specific ventilation rate, q [m ³ /m ² h]	0.50
Relative humidity of supply air, RH [%]	50 ± 5	Loading factor [m ² /m ³]	1.0
Temperature of supply air, T [°C]	23 ± 1	Test scenario	Wall

4.5 Deviations from Referenced Protocols and Regulations

No deviations from the referenced test methods were observed.

4.6 Picture of Sample



5 Results

5.1 Emission Test Results after 28 Days

Loading factor 1.0 m²/m³ and air change rate 0.5 h⁻¹ used for the calculation of the reference room concentrations.

	CAS No.	Retention time	ID-Cat	Toluene eq.	Toluene SER	Specific Conc.	SER	EU-LCI	R value
		[min]		[µg/m ³]	[µg/(m ² ·h)]	[µg/m ³]	[µg/(m ² ·h)]	[µg/m ³]	-
VOC compounds									
Dihydroxydimethylsilane	1066-42-8	8.30	2	< 5	< 2				
Hexamethylcyclotrisiloxane	541-05-9	13.35	2	< 5	< 2				
Diethylene glycol	111-46-6	18.48	1	5	2	35	17	5700	0.006
Benzaldehyde	100-52-7	18.68	2	< 5	< 2				
Phenol	108-95-2	19.05	1	< 5	< 2	< 5	< 2	70	
Octamethylcyclotetrasiloxane	556-67-2	19.46	1	< 5	< 2	< 5	< 2	116000	
2-Ethyl-1-hexanol	104-76-7	20.69	1	< 5	< 2	< 5	< 2	300	
Propargyl Butylcarbamate	76114-73-3	26.59	2	< 5	< 2				
Triethylene glycol	112-27-6	26.62	2	< 5	< 2				
Decyl ether	2456-28-2	31.96	2	< 5	< 2				
1-dodecanol	112-53-8	32.70	2	5	3				
TVOC				11	5	35	17		
VVOC compounds									
None determined									
TVVOC				< 5	< 2				
SVOC compounds									
None determined									
TSVOC				< 5	< 2				
CMR substances									
None determined									
Total CMR				< 1	< 1	< 1	< 1		
Very volatile carbonyl compounds									
Formaldehyde	50-00-0		1			< 5	< 2	100	
Acetaldehyde	75-07-0		1			< 5	< 2	300	
Propanal	123-38-6		1			< 5	< 2	650	
Butanal	123-72-8		1			< 5	< 2	650	
Acetone	67-64-1		1			< 5	< 2	120000	
Sum of R values									0.006

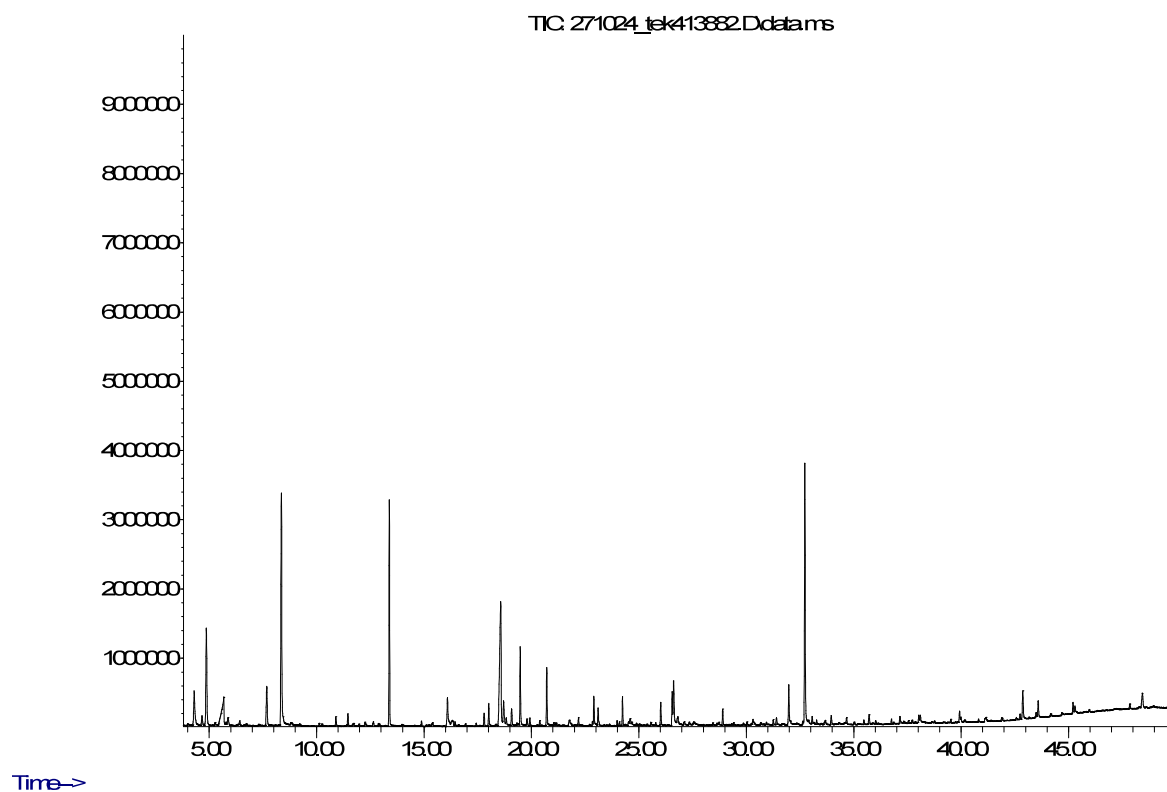
6 General Test References

1. Nordic Ecolabelling for Paints and varnishes. Version 4.0. 14 September 2023 – 15 September 2028.
2. EN 16516 + A1 Construction products: Assessment of release of dangerous substances. Determination of emissions into indoor air.
3. ISO 16000-11 Determination of the emission of volatile organic compounds from samples of building products and furnishing. Sampling, storage of samples and preparation of test specimens.
4. ISO 16000-9 Determination of the emission of volatile organic compounds from building products and furnishing. Emission test chamber method.
5. ISO 16000-6 Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA ® sorbent, thermal desorption and gas chromatography using MS or MS-FID.
6. EU-LCI VOC-compound emission https://ec.europa.eu/growth/sectors/construction/eu-lci/values_en
7. ISO 16000-3 Determination of formaldehyde and other carbonyl compounds – Active sampling method.
8. In-house method KEMIA-TY-011 based on standard ISO 16000-3. Institute of Occupational Health.

7 Appendices

7.1 Chromatogram

Abundance



7.2 Sampling Report

Sampler (name, company, contact info)	Manufacturer (if deviating from customer)
Anniriina Hytönen, Teknos Oy Takkatie 3, P.O. Box 107, FI-00371 HELSINKI	
Name(s) of the product	Type of the product
BIORA 20 (NCS S 3560G)	Water-borne wall paint
Date of manufacturing	Batch number
1.11.2023	409516-301
Date of sampling	Amount of material sampled
23.8.2024	0,9 L
The sample is taken from	How was the product stored prior to sampling
Production line ☐ Stock / storage ☒ Miscellaneous, specify ☐	Not stored ☐ Open ☐ Stacked ☐ Wrapped up, specify ☒
Date of assembly (office chairs and furniture)	Unopened can taken from the warehouse, tinted on the sampling day
If a sub-sample was collected from a larger material amount, please describe how the sub-sample was taken	
 235 - 2024 - 00360204	
Observations and remarks	
Density: 1,1 g/ml	
Confirmation	
The signer herewith confirms that the information given in this document is correct and that the sample was selected, sampled, and packed in accordance with current version of the M1 testing protocol.	
Date	Signature
3.9.2024	 Anniriina Hytönen

7.3 How to Understand the Results

7.3.1 Acronyms Used in the Report

- * Not a part of FINAS T001 accreditation
- < Means less than
- > Means bigger than
- § Deviation from method. Please see deviation section
- SER Specific emission rate
- a The method is not optimal for very volatile compounds. For these substances smaller results and a higher measurement uncertainty cannot be ruled out.
- b The results have been corrected by the emission from untreated product specific substrate. Possible secondary emissions from the substrate cannot be excluded.
- c Very polar organic compounds are not suitable for reliable quantification using Tenax TA adsorbent and HP-5 GC column. A high degree of uncertainty must be expected.
- d The component may be underestimated due to exceeding the linear calibration range (contribution from the system) SER Specific Emission Rate.

7.3.2 Explanation of ID Category

Categories of Identity:

- 1: Identified by comparison with a mass spectrum obtained from library and supported by other information and quantified through specific calibration.
- 2: Identified by comparison with a mass spectrum obtained from library and supported by other information. Quantified as toluene equivalent.
- 3: Identified with a lower match by comparison with a mass spectrum obtained from a library. Quantified as toluene equivalent.
- 4: Not identified. quantified as toluene equivalent.

7.4 Description of VOC Emission Test

7.4.1 Test Chamber

The test chamber is made of stainless steel. A multi-step air clean-up is performed before loading the chamber, and a blank check of the empty chamber is performed. The chamber operation parameters are as described in the test method section. /2.4/

7.4.2 Expression of the Test Results

All test results are calculated as specific emission rate (SER), and as extrapolated air concentration in the European Reference Room. /2/

7.4.3 Testing of VOC, SVOC and VVOC

The emissions of volatile organic compounds including volatile CMR substances (EU Class 1A and 1B, as per European law) are tested by drawing sample air from the test chamber outlet through Tenax TA tubes

after the specified duration of storage in the ventilated test chamber. Analysis is performed by TD-GC/MS using HP-5 column (50 m. 0.2mm ID. 0.33µm film) /2.5/.

All CMR substances and single substances that are listed with a EU-LCI value in the latest publications /6/ (hereafter referred to as target compounds) are identified if present. All other appearing VOCs are identified as far as possible. Quantification of target compounds is done using the TIC signal and authentic response factors, or the relative response factors relative to toluene. For certain compound groups, which differ significantly in chemistry from toluene, quantification can be performed relative to a representative member of the group for more accurate and precise results. This can include quantification of for example glycols and acids. In addition to that, all results are also expressed in toluene equivalents. All non-target compounds, as well as all non-identified substances, are quantified in toluene equivalents.

The results of the individual substances (CMR substances not included) are calculated in three groups depending on their retention time when analyzing using a non-polar column (HP-5):

- Volatile Organic Compounds (VOC) are defined as: All substances eluting between n-hexane (n-C6) and n-hexadecane (n-C16) including n-hexane, n-hexadecane, acetic acid and 2.2.4-trimethyl-1.3-pentanediol-di-isobutyrate
- Semi-Volatile Organic Compounds (SVOC) are defined as: All substances eluting after n-hexadecane (n-C16) and before and including n-docosane (n-C22)
- Very Volatile Organic Compounds (VVOC) are defined as: All substances eluting before n-hexane (n-C6).

The results of the CMR substances are calculated in their own group.

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs between n-hexane and n-hexadecane with a concentration $\geq 5 \mu\text{g}/\text{m}^3$. Compounds regarded as VOC in line with the above definition but elute before n-C6 or after n-C16 on the HP-5 column are treated as VOC, and are thus added to the TVOC.

Total Semi-Volatile Organic Compounds (TSVOC) is calculated by the summation of all individual SVOCs expressed in toluene equivalents with a concentration $\geq 5 \mu\text{g}/\text{m}^3$, as defined in EN 16516. VOCs that are regarded as VOC in line with the above definition, but elute after n-C16 in this test, are not added to the TSVOC.

Total Very Volatile Organic Compounds (TVVOC) is calculated by the summation of all individual VVOCs with a concentration $\geq 5 \mu\text{g}/\text{m}^3$ and expressed in toluene equivalents. VOCs that are regarded as VOC in line with the above definition, but elute before n-C6 in this test, are not added to the TVVOC.

This test only covers substances which can be adsorbed on Tenax TA and can be thermally desorbed. If emissions of substances outside these specifications occur then these substances cannot be detected (or with limited reliability only).

7.4.4 Testing of Formaldehyde and Other Very Volatile Carbonyl Compounds

Formaldehyde was absorbed in dinitrophenyl hydrazine and analysed with liquid chromatography /2.7.8/. The limit of quantification is $1 \mu\text{g}/\text{m}^3$. The analysis was made at the Institute of Occupational Health.

7.4.5 Calculation of R Values with EU-LCI List

The R value is calculated dividing the concentrations of detected compounds $\geq 5 \mu\text{g}/\text{m}^3$ by their respective EU-LCI value. The sum of R values is calculated by summation of all individual R values.