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## VOC EMISSION TEST REPORT

### ISO 16000

11 June 2024

#### 1 Sample Information

|                        |                    |
|------------------------|--------------------|
| Sample name            | Gratnells Mini Bin |
| Batch no.              | 140009713          |
| Stated production date | 13/02/2024         |
| Product type           | Furniture          |
| Sample reception       | 24/04/2024         |



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## Table of contents

|          |   |          |
|----------|---|----------|
| <b>1</b> | <b>Sample Information</b>                                 | <b>1</b> |
| <b>2</b> | <b>Applied Test Methods</b>                               | <b>3</b> |
| 2.1      | General Test References                                   | 3        |
| 2.2      | Specific Laboratory Sampling and Analyses                 | 3        |
| <b>3</b> | <b>Test Parameters, Sample Preparation and Deviations</b> | <b>4</b> |
| 3.1      | VOC Emission Chamber Test Parameters                      | 4        |
| 3.2      | Preparation of the Test Specimen                          | 4        |
| 3.3      | Picture of Sample   | 4        |
| 3.4      | Deviations from Referenced Protocols and Regulations      | 5        |
| 3.5      | Air Samplings from the Test Chamber                       | 5        |
| <b>4</b> | <b>Results</b>  | <b>6</b> |
| 4.1      | VOC Emission Test Results after 3 Days                    | 6        |
| <b>5</b> | <b>Appendices</b>   | <b>7</b> |
| 5.1      | Chromatogram of VOC Emissions after 3 Days                | 7        |
| 5.2      | How to Understand the Results                             | 8        |
| 5.3      | Description of VOC Emission Test                          | 9        |
| 5.4      | Quality Assurance   | 10       |
| 5.5      | Accreditation   | 10       |
| 5.6      | Uncertainty of the Test Method                            | 10       |
| 5.7      | Version History   | 11       |

## 2 Applied Test Methods

### 2.1 General Test References

| Regulation, protocol or standard | Version                     | Reporting limit VOC [ $\mu\text{g}/\text{m}^3$ ] | Calculation of TVOC | Combined uncertainty <sup>a</sup> [RSD(%)] |
|----------------------------------|-----------------------------|--|---------------------|--|
| EN 16516                         | 2017 + A1:2020              | 5  | Toluene equivalents | 22%  |
| ISO 16000 -3 -6 -9 -11           | 2021-2024 depending on part | 2  | Toluene equivalents | 22%  |
| ASTM D5116-17                    | 2017                        | -  | -                   | -  |

### 2.2 Specific Laboratory Sampling and Analyses

| Procedure                | External Method                         | Internal SOP | Quantification limit / sampling volume | Analytical principle    | Uncertainty <sup>a</sup> [RSD(%)] |
|--------------------------|---|--------------|--|-------------------------|-----------------------------------|
| Sample preparation       | ISO 16000-11:2024                       | 71M549810    | -                                      | -                       | -                                 |
| Emission chamber testing | ISO 16000-9:2024, EN 16516:2017+A1:2020 | 71M549811    | -                                      | Chamber and air control | -                                 |
| Sampling of VOC          | ISO 16000-6:2021, EN 16516:2017+A1:2020 | 71M549812    | 5 L                                    | Tenax TA                | -                                 |
| Analysis of VOC          | ISO 16000-6:2021, EN 16516:2017+A1:2020 | 71M542808B   | 1 $\mu\text{g}/\text{m}^3$             | ATD-GC/MS               | 10%                               |

The analysis are carried out on the sample(s) as received and the result(s) are only valid for the tested sample(s).

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### 3 Test Parameters, Sample Preparation and Deviations

#### 3.1 VOC Emission Chamber Test Parameters

| Parameters   | Value  | Sample Conditions  | Value                   |
|--|--------|--|-------------------------|
| Chamber volume, V[L]   | 119    | Date and time of unpacking and start of sample preparation | 21/05/2024 - 11:05      |
| Air change rate, n[h <sup>-1</sup> ]   | 0.5    | Preconditioning period                                     | -                       |
| Air Velocity [m/s]   | 0.1    | Chamber test period  | 21/05/2024 - 24/05/2024 |
| Area specific ventilation rate, q [m/h or m <sup>3</sup> /m <sup>2</sup> /h] | 0.62   | Analytical test period                                     | 21/05/2024 - 11/06/2024 |
| Relative humidity of supply air, RH [%]                                      | 50 ± 3 | Exposed sample area [m <sup>2</sup> ]                      | 0.0962                  |
| Temperature of supply air, T [°C]  | 23 ± 1 | Loading factor [m <sup>2</sup> /m <sup>3</sup> ]           | 0.81                    |
| Background concentration of individual VOC's [µg/m <sup>3</sup> ]            | < 2    | Sample thickness [mm]                                      | 7.0                     |
| Background concentration of TVOC [µg/m <sup>3</sup> ]                        | < 20   |  |                         |

#### 3.2 Preparation of the Test Specimen

The sample was transferred directly to the chamber.

#### 3.3 Picture of Sample



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### 3.4 Deviations from Referenced Protocols and Regulations

No deviations from the referenced test methods were observed.

### 3.5 Air Samplings from the Test Chamber

| Sampling media      | Day (yyyy-mm-dd) | Time (hh:mm)  | Volume [L] |
|---------------------|------------------|---------------|------------|
| 3 Day, Tenax TA     | 2024-05-24       | 10:33 - 11:32 | 5.1        |
| 3 Day-Res, Tenax TA | 2024-05-24       | 10:34 - 11:24 | 2.4        |

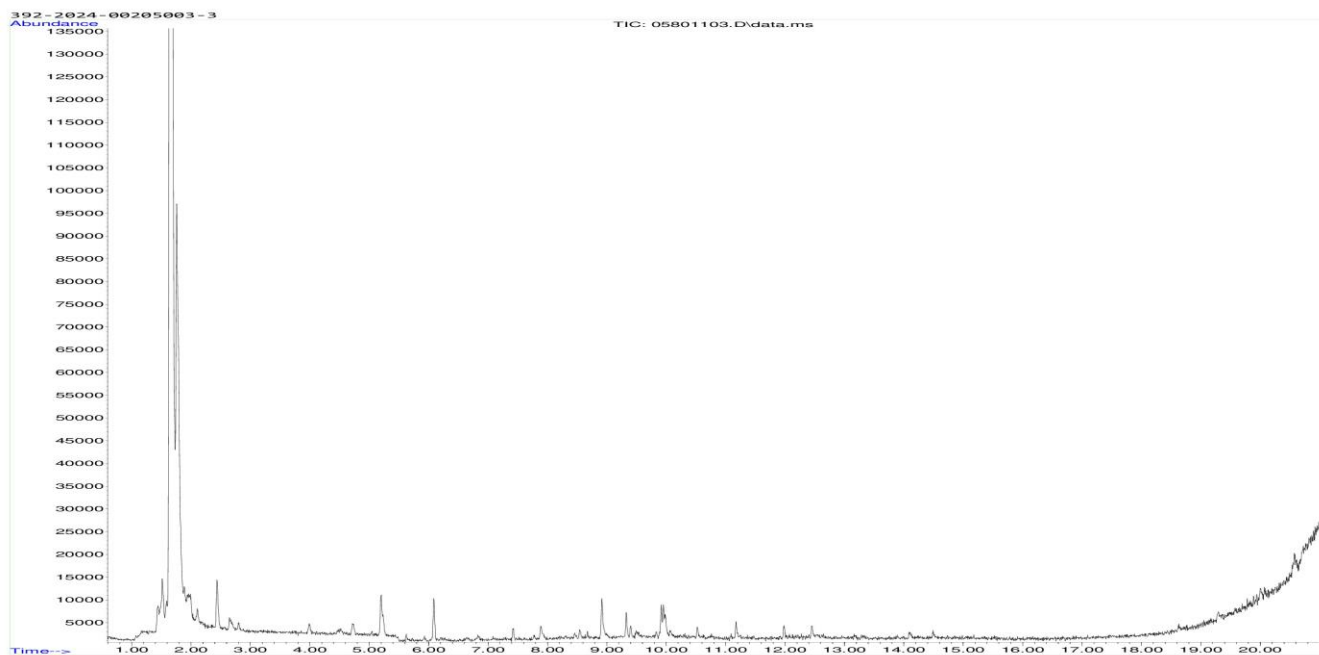
## 4 Results

### 4.1 VOC Emission Test Results after 3 Days

|                          | CAS No. | Retention time<br>[min] | ID-Cat | Specific Conc.<br>[µg/m³] | Toluene eq.<br>[µg/m³] | Specific SER<br>[µg/(m²·h)] |
|--------------------------|---------|-------------------------|--------|---------------------------|------------------------|-----------------------------|
| <b>VOC compounds</b>     |         |                         |        |                           |                        |                             |
| None determined          |         |                         |        |                           |                        |                             |
| <b>TVOC</b>              |         |                         |        | < 2                       | < 2                    | < 2                         |
| <b>VVOC compounds</b>    |         |                         |        |                           |                        |                             |
| None determined          |         |                         |        |                           |                        |                             |
| <b>TVVOC</b>             |         |                         |        | < 2                       | < 2                    | < 2                         |
| <b>SVOC compounds</b>    |         |                         |        |                           |                        |                             |
| None determined          |         |                         |        |                           |                        |                             |
| <b>TSVOC</b>             |         |                         |        | < 2                       | < 2                    | < 2                         |
| <b>Carcinogens</b>       |         |                         |        |                           |                        |                             |
| <b>Total carcinogens</b> |         |                         |        | < 1                       | < 1                    | < 1                         |

## 5 Appendices

### 5.1 Chromatogram of VOC Emissions after 3 Days



## 5.2 How to Understand the Results

### 5.2.1 Acronyms Used in the Report

|     |  |
|-----|--|
| <   | Means less than  |
| >   | Means bigger than  |
| *   | Not a part of our accreditation  |
| α   | Please see section regarding uncertainty in the Appendices   |
| §   | Deviation from method. Please see deviation section  |
| 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 component originates from the substrate and is thus removed  |
| c   | The results have been corrected by the emission from the substrate   |
| d   | Very polar organic compounds are not suitable for reliable quantification using Tenax TA adsorbent and HP-5ms GC column. A high degree of uncertainty must be expected |
| e   | The component may be overestimated due to contribution from the system   |
| SER | Specific Emission Rate   |

### 5.2.2 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.

## 5.3 Description of VOC Emission Test

### 5.3.1 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. (EN 16516, ISO 16000-9, internal method no.: 71M549811).

The recovery rates in the climate test chamber have been investigated using toluene and n-dodecane. The mean recovery rates of toluene and n-dodecane were concluded to be between 95 % and 100 % depending on the chamber size. These values comply with the criteria of a minimum mean recovery rate of 80 % stated in the 16000-9 test method.

Air sampling from the test chamber is carried out in a clean test chamber room at ambient air pressure and  $23 \pm 1$  °C.

### 5.3.2 Expression of the Test Results

All test results are calculated as specific emission rate, and as extrapolated air concentration in the European Reference Room (EN 16516, AgBB, EMICODE, M1 and Indoor Air Comfort).

### 5.3.3 Testing of Carcinogenic VOCs

The emission of carcinogens (EU Categories C1A and C1B, as per European law) is 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 ATD-GC/MS (automated thermal desorption coupled with gas chromatography and mass spectroscopy using 30 m HP-5 (slightly polar) column with 0.25 mm ID and 0.25 µm film, Agilent) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

All identified carcinogenic VOCs are listed; if a carcinogenic VOC is not listed then it has not been detected. Quantification is performed using the TIC signal and authentic response factors, or the relative response factors relative to toluene for the individual compounds.

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

### 5.3.4 Testing of VOC, SVOC and VVOC

The emissions of volatile organic compounds 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 ATD-GC/MS using HP-5 column (30 m, 0.25mm ID, 0.25µm film) (EN 16516, ISO 16000-6, internal methods no.: 71M549812 / 71M542808B).

All single substances that are listed with a LCI/NIK value in the latest publications (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 is 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 are calculated in three groups depending on their retention time when analyzing using a non-polar column (HP-1):

- Volatile Organic Compounds (VOC) are defined as: All substances eluting between and including n-hexane (n-C6) and n-hexadecane (n-C16)

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- 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).

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs with a concentration  $\geq 5 \mu\text{g}/\text{m}^3$ . The TVOC can be expressed either in toluene equivalents as defined in EN 16516 and similar to ISO 16000-6, or as the sum of concentrations using specific or relative response factors. In the case of summation of concentrations using authentic or relative response factors, the toluene equivalent is applied to all non-target and non-identified VOCs before summing up. 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).

## 5.4 Quality Assurance

Before loading the test chamber, a blank check of the empty chamber is performed and compliance with background concentrations in accordance with EN 16516 / ISO 16000-9 is determined.

Air sampling at the chamber outlet and subsequent analysis is performed in duplicate. Relative humidity, temperature and air change rate in the chambers is logged every 5 minutes and checked daily. A double determination is performed on random samples at a regular interval and results are registered in a control chart to ensure the uncertainty and reproducibility of the method.

The stability of the analytical system is checked by a general function test of device and column, and by use of control charts for monitoring the response of individual substances prior to each analytical sequence.

## 5.5 Accreditation

The testing methods described above are accredited online with EN ISO/IEC 17025 by DANAK (no. 522). This accreditation is valid worldwide due to mutual approvals of the national accreditation bodies (ILAC/IAF, see also [www.eurofins.com/galten.aspx#accreditation](http://www.eurofins.com/galten.aspx#accreditation)).

Eurofins Product Testing Denmark A/S is notified body for the construction products regulation (EU) No 305/2011 with number NB 2657 under system 3.

Not all parameters are covered by this accreditation. The accreditation does not cover parameters marked with an asterisk (\*), however analysis of these parameters is conducted at the same level of quality as for the accredited parameters.

## 5.6 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty  $U_m$  equals 2 x

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RSD. For further information please visit [www.eurofins.dk/product-testing/uncertainty/](http://www.eurofins.dk/product-testing/uncertainty/).

## 5.7 Version History

| Report date | Report number          | Modification    |
|-------------|------------------------|-----------------|
| 11/06/2024  | 392-2024-00205003_Q_EN | Current version |