

# Attestation

## Italian CAM

On 7 April 2022, Eurofins Product Testing A/S received a sample of a table top with the product name:

### IVM COLLEZIONI OPERATIVE

supplied by

**IVM Spa**

The emissions were tested according to the Italian CAM Decree GU n.23 del 28-01-2017. Sampling, testing and evaluation were performed according to ANSI/BIFMA (see the test report no. 392-2022-00105501\_M\_EN).

**The results of the tested sample indicate that the product comply with Italian CAM by showing compliance with:**

- The limit values of ANSI/BIFMA

19 April 2022



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## VOC TEST REPORT ANSI/BIFMA

19 April 2022

### 1 Sample Information

|                        |                          |
|------------------------|--------------------------|
| Sample name            | IVM COLLEZIONI OPERATIVE |
| Batch no.              | 35524                    |
| Stated production date | 17/02/2022               |
| Product type           | Table top                |
| Sample reception       | 07/03/2022               |

### 2 Brief Evaluation of the Results

| Regulation or protocol    | Conclusion | Version of regulation or protocol                       |
|---------------------------|------------|---------------------------------------------------------|
| ANSI/BIFMA, section 7.6.1 | Pass       | ANSI/BIFMA e3-2014e "Furniture Sustainability Standard" |
| ANSI/BIFMA, section 7.6.2 | Pass       | ANSI/BIFMA e3-2014e "Furniture Sustainability Standard" |

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



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### 3 Applied Test Methods

#### 3.1 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           | 2006-2021 depending on part                    | 2                                                | Toluene equivalents | 22%                                        |
| ASTM D5116-10                    | 2010                                           | -                                                | -                   | -                                          |
| ANSI/BIFMA                       | ANSI/BIFMA M7.1-2011 (R2016)                   | 2                                                | Toluene equivalents | 22%                                        |
| ANSI/BIFMA                       | e3-2014e                                       | -                                                | -                   | -                                          |
| CDPH                             | CDPH/EHLB/Standard Method V1.2. (January 2017) | 2                                                | Toluene equivalents | 22%                                        |

#### 3.2 Specific Laboratory Sampling and Analyses

| Procedure                | External Method                                                   | Internal S.O.P. | Quantification limit         | Analytical principle    | Uncertainty <sup>a</sup> [RSD(%)] |
|--------------------------|-------------------------------------------------------------------|-----------------|------------------------------|-------------------------|-----------------------------------|
| Sample preparation       | ISO 16000-11:2006, EN 16516:2017+A1:2020, AgBB:2021, EMICODE:2020 | 71M549810       | -                            | -                       | -                                 |
| Emission chamber testing | ISO 16000-9:2006, 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%                               |
| Sampling of aldehydes    | ISO 16000-3:2011, EN 16516:2017+A1:2020                           | 71M549812       | 35 L                         | DNPH                    | -                                 |
| Analysis of aldehydes    | ISO 16000-3:2011, EN 16516:2017+A1:2020                           | 71M548400       | 3-6 $\mu\text{g}/\text{m}^3$ | HPLC-UV                 | 10%                               |

The results are only valid for the tested sample(s).

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## 4 Test Parameters, Sample Preparation and Deviations

### 4.1 VOC Emission Chamber Test Parameters

| Parameter                                                                    | Value  | Parameter                                        | Value                   |
|------------------------------------------------------------------------------|--------|--------------------------------------------------|-------------------------|
| Chamber volume, V[L]                                                         | 119    | Preconditioning period                           | -                       |
| Air Change rate, n[h <sup>-1</sup> ]                                         | 1      | Chamber test period                              | 15/03/2022 – 22/03/2022 |
| Area specific ventilation rate, q [m/h or m <sup>3</sup> /m <sup>2</sup> /h] | 1      | Analytical test period                           | 15/03/2022 – 05/04/2022 |
| Relative humidity of supply air, RH [%]                                      | 50 ± 3 | Loading factor [m <sup>2</sup> /m <sup>3</sup> ] | 1                       |
| Temperature of supply air, T [°C]                                            | 23 ± 1 |                                                  |                         |

### 4.2 Preparation of the Test Specimen

Edges were covered with aluminium foil tape. The sample was placed in the test chamber on one of the covered edges to allow emissions from both front and back.

### 4.3 Picture of Sample



### 4.4 Deviations from Referenced Protocols and Regulations

No deviations from the referenced test methods were observed.

#### 4.5 VOC Emission Test Results after 3 and 7 Days

|                         | CAS No. | Retention time<br>[min] | ID-Cat | 3 day conc.<br>[µg/m³] | 3 day SER<br>[µg/(m²h)] | 7 day conc.<br>[µg/m³] | 7 day SER<br>[µg/(m²h)] |
|-------------------------|---------|-------------------------|--------|------------------------|-------------------------|------------------------|-------------------------|
| <b>VOC Compounds</b>    |         |                         |        |                        |                         |                        |                         |
| None determined         |         |                         |        | < 2                    | < 3                     | < 2                    | < 3                     |
| <b>TVOC toluene eq.</b> |         |                         |        | < 2                    | < 3                     | < 2                    | < 3                     |
| <b>TVOC specific</b>    |         |                         |        | < 2                    | < 3                     | < 2                    | < 3                     |
| <b>Aldehydes</b>        |         |                         |        |                        |                         |                        |                         |
| Formaldehyde            | 50-00-0 |                         | 1      | 4.7                    | 4.7                     | 3.9                    | 3.9                     |
| Acetaldehyde            | 75-07-0 |                         | 1      | < 3                    | < 4                     | < 3                    | < 4                     |

#### 4.6 Results as Extrapolated to 14 Days VOC Emission

|                         | CAS No. | Retention time<br>[min] | ID-Cat | SER<br>[µg/(m²h)] | Open plan<br>[µg/m³] | Private office<br>[µg/m³] |
|-------------------------|---------|-------------------------|--------|-------------------|----------------------|---------------------------|
| <b>VOC Compounds</b>    |         |                         |        |                   |                      |                           |
| None determined         |         |                         |        | < 3               | < 2                  | < 1                       |
| <b>TVOC toluene eq.</b> |         |                         |        | < 3               | < 2                  | < 1                       |
| <b>TVOC specific</b>    |         |                         |        | < 3               | < 2                  | < 1                       |
| <b>Aldehydes</b>        |         |                         |        |                   |                      |                           |
| Formaldehyde            | 50-00-0 |                         | 1      | < 4               | 1.7                  | 0.8                       |
| Acetaldehyde            | 75-07-0 |                         | 1      | < 4               | < 2                  | < 1                       |

#### 4.6.1 Calculation of Concentration after 14 Days

The emission rates (SER) after 3 and 7 days were extrapolated to 14 day emission rates using equation 8, 9, 10 given in ANSI/BIFMA M7.1-2011.

$$(8) \quad E_{14} = a \cdot t_3^{-b}$$

$$(9) \quad b = \frac{\ln E(t_1) - \ln E(t_2)}{\ln t_2 - \ln t_1}$$

$$(10) \quad a = E(t_1) \cdot t_1^b = E(t_2) \cdot t_2^b$$

$E_{14}$  = Emission rate after 14 days (336 hours)

$t_1$  = 3 days (72 hours),  $t_2$  = 7 days (168 hours) and  $t_3$  = 14 days (336 hours)

The emission rates as calculated after 14 days were used to calculate model room concentrations using the following formula:

$$C = \frac{A \cdot E}{Q}$$

with:

C Model room concentration,  $\mu\text{g}/\text{m}^3$

A Workstation surface area

Open plan: Panel area = 11.08  $\text{m}^2$ , **work surface area = 6.10  $\text{m}^2$** , storage area = 4.57  $\text{m}^2$

Private office: Panel area = 7.63  $\text{m}^2$ , **work surface area = 6.73  $\text{m}^2$** , storage area = 10.55  $\text{m}^2$

E Area specific emission factor,  $\mu\text{g}/(\text{unit} \cdot \text{h})$

Q Ventilation rate, Open plan = 15.01  $\text{m}^3/\text{h}$ , private office = 34.67  $\text{m}^3/\text{h}$

## 5 Summary and Evaluation of the Results

### 5.1 Comparison with Limit Values of ANSI/BIFMA; section 7.6.1

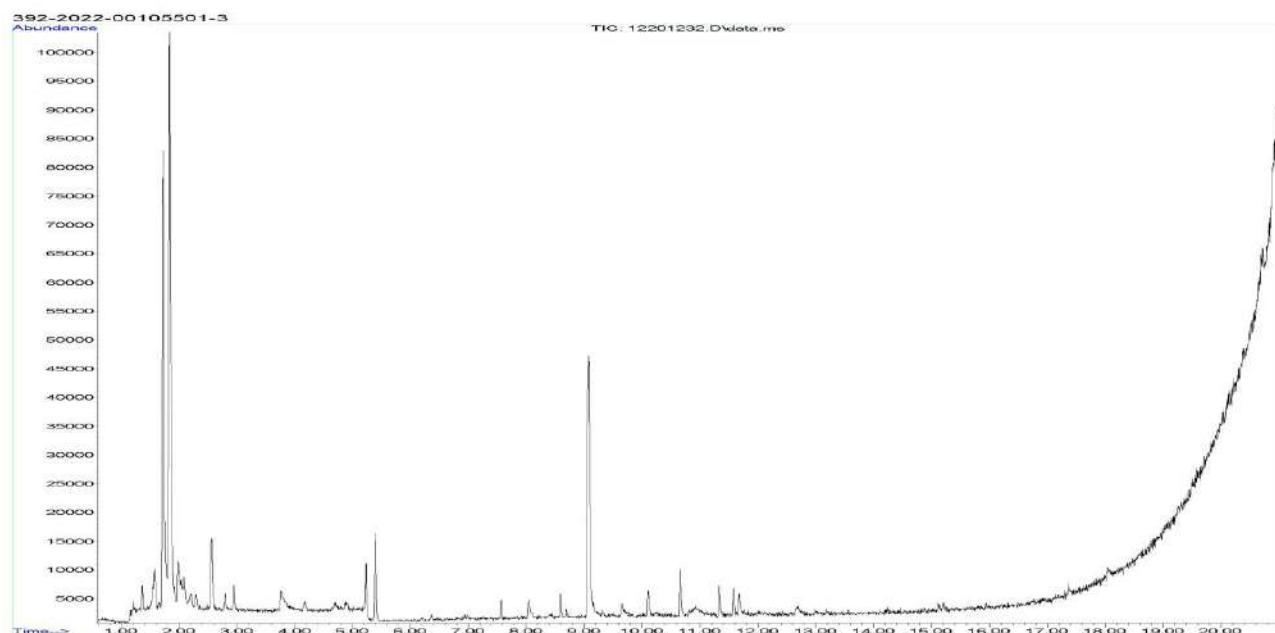
| Parameter               | Results after 7 days                                |                                                                 |                                                                      |
|-------------------------|-----------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------|
|                         | Emission rate<br>$\mu\text{g}/(\text{m}^2\text{h})$ | Limit value,<br>open plan<br>$\mu\text{g}/(\text{m}^2\text{h})$ | Limit value,<br>private office<br>$\mu\text{g}/(\text{m}^2\text{h})$ |
| TVOC <sub>toluene</sub> | < 3                                                 | < 345                                                           | < 694                                                                |
| 4-Phenylcyclohexene     | < 3                                                 | < 4.5                                                           | < 9.0                                                                |
| Formaldehyde            | < 4                                                 | < 42.3                                                          | < 85.1                                                               |
| Total aldehydes (other) | 0.09 $\mu\text{mol}/(\text{m}^2\cdot\text{h})$      | < 2.8 $\mu\text{mol}/(\text{m}^2\cdot\text{h})$                 | < 5.7 $\mu\text{mol}/(\text{m}^2\cdot\text{h})$                      |

### 5.2 Comparison with Limit Values of ANSI/BIFMA; section 7.6.2

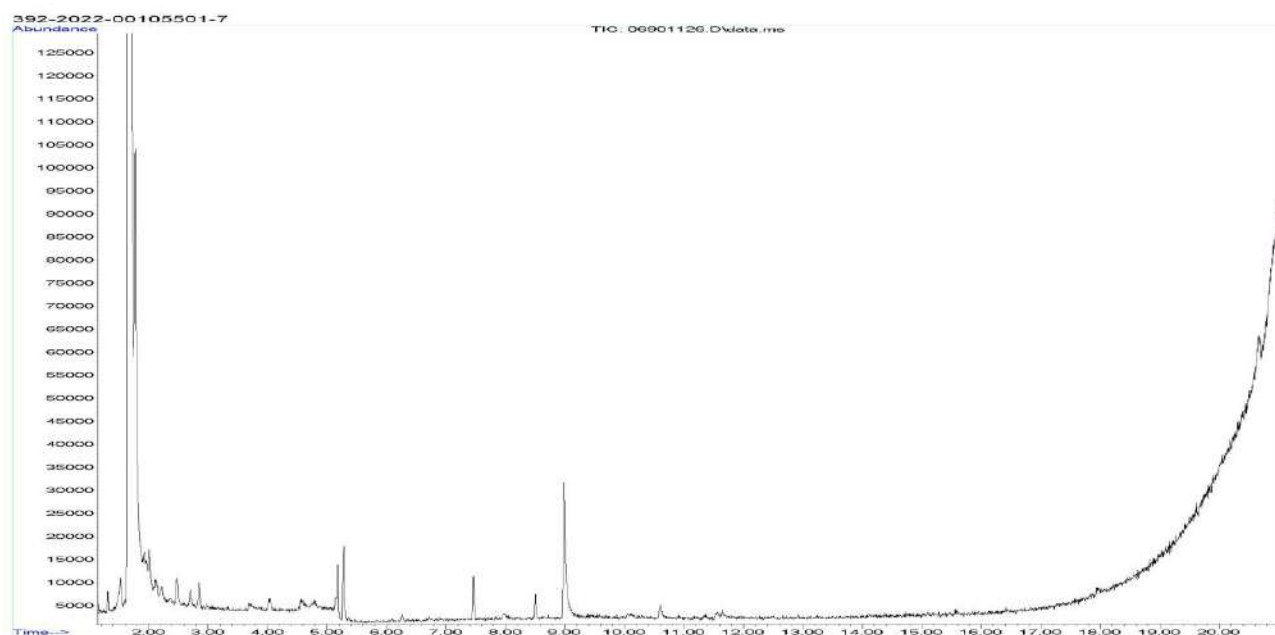
|                                                        |          |
|--------------------------------------------------------|----------|
| Individual compounds with<br>CHREL-value after 14 days | Complies |
|--------------------------------------------------------|----------|

## 6 Appendices

### 6.1 Chromatogram of VOC Emissions after 3 Days



### 6.2 Chromatogram of VOC Emissions after 7 Days



Please consider the different scales.

The results are only valid for the tested sample(s).

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## 6.3 How to Understand the Results

### 6.3.1 Acronyms Used in the Report

- < Means less than
- > Means bigger than (Tube/GC-MS overload)
- \* Not a part of our accreditation
- α Um(%) is given as 2x RSD%. 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 wooden panels and is thus removed.
- c The results have been corrected by the emission from wooden panels.
- d 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.

SER Specific emission rate.

### 6.3.2 Explanation of ID Category

#### Categories of Identity:

- 1: Identified and specifically calibrated
- 2: Identified by comparison with a mass spectrum obtained from library and supported by other information. Calibrated as toluene equivalent.
- 3: Identified by comparison with a mass spectrum obtained from a library. Calibrated as toluene equivalent.
- 4: Not identified, calibrated as toluene equivalent.

## 6.4 Qualitative Description of VOC Emission Test

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

### 6.4.2 Expression of the Test Results

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

### 6.4.3 Testing of VOCs

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).

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)
- 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.

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).

### 6.4.4 Testing of Aldehydes

The presence of aldehydes after the specified duration of storage in the ventilated test chamber is tested by drawing air samples from the test chamber outlet through DNPH-coated silicagel tubes after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by HPLC and UV-/diode array detection (EN 16516, ISO 16000-3, VDI 3862 Blatt 3, internal methods no.: 71M549812 / 71M548400).

The absence of formaldehyde and other aldehydes is stated if UV detector response at the specific wavelength is lacking at the specific retention time in the chromatogram. Otherwise it is checked whether the reporting limit is exceeded. In this case the identity is finally checked by comparing full scan sample UV spectra with full scan standard UV spectra.

#### 6.4.5 Maximum Allowable Emission Factors

Below is given the maximum allowable emission factor after 14 days, as defined by BIFMA, for compounds with a CHREL value.

| Compound                                 | CAS nr.                     | Max allowable emission factor Open Plan<br>$\mu\text{g}/(\text{m}^2\text{h})$ | Max allowable emission factor Private office<br>$\mu\text{g}/(\text{m}^2\text{h})$ |
|------------------------------------------|-----------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Ethylbenzene                             | 100-41-4                    | 689                                                                           | 1392                                                                               |
| Styrene                                  | 100-42-5                    | 310                                                                           | 627                                                                                |
| 1,4-Dichlorobenzene                      | 106-46-7                    | 276                                                                           | 557                                                                                |
| Epichlorohydrin                          | 106-89-8                    | 1.0                                                                           | 2.1                                                                                |
| Ethylene glycol                          | 107-21-1                    | 138                                                                           | 278                                                                                |
| 1-Methoxy-2-propanol                     | 107-98-2                    | 2413                                                                          | 4874                                                                               |
| Vinyl acetate                            | 108-05-4                    | 68.9                                                                          | 139                                                                                |
| Toluene                                  | 108-88-3                    | 103                                                                           | 209                                                                                |
| Chlorobenzene                            | 108-90-7                    | 345                                                                           | 696                                                                                |
| Phenol                                   | 108-95-2                    | 68.9                                                                          | 139                                                                                |
| 2-Methoxyethanol                         | 109-86-4                    | 21                                                                            | 42                                                                                 |
| Ethylene glycol monomethyl ether acetate | 110-49-6                    | 31                                                                            | 63                                                                                 |
| n-Hexane                                 | 110-54-3                    | 2413                                                                          | 4874                                                                               |
| 2-Ethoxyethanol                          | 110-80-5                    | 24                                                                            | 49                                                                                 |
| 2-Ethoxyethyl acetate                    | 111-15-9                    | 103                                                                           | 209                                                                                |
| 1,4-Dioxane                              | 123-91-1                    | 1034                                                                          | 2089                                                                               |
| Tetrachloroethylene                      | 127-18-4                    | 12.1                                                                          | 24.4                                                                               |
| Formaldehyde                             | 50-00-0                     | 11                                                                            | 23                                                                                 |
| Isopropanol                              | 67-63-0                     | 2413                                                                          | 4874                                                                               |
| Chloroform                               | 67-66-3                     | 103                                                                           | 209                                                                                |
| N,N-Dimethyl Formamide                   | 68-12-2                     | 28                                                                            | 56                                                                                 |
| Benzene                                  | 71-43-2                     | 21                                                                            | 42                                                                                 |
| 1,1,1-Trichloroethane                    | 71-55-6                     | 345                                                                           | 696                                                                                |
| Acetaldehyde                             | 75-07-0                     | 48                                                                            | 97                                                                                 |
| Methylene Chloride                       | 75-09-2                     | 138                                                                           | 278                                                                                |
| Carbon Disulfide                         | 75-15-0                     | 276                                                                           | 557                                                                                |
| Trichloroethylene                        | 79-01-6                     | 207                                                                           | 418                                                                                |
| 1-Methyl-2-Pyrrolidinone                 | 872-50-4                    | 110                                                                           | 223                                                                                |
| Naphthalene                              | 91-20-3                     | 3                                                                             | 6                                                                                  |
| Xylenes (m-,o-, p-Xylene combined)       | 108-38-3, 95-47-6, 106-42-3 | 241                                                                           | 487                                                                                |

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## 6.5 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.

## 6.6 Accreditation

The testing methods described above are accredited on line 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)).

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.

## 6.7 Uncertainty of the Test Method

The relative standard deviation of the overall analysis is 22%. The expanded uncertainty  $U_m$  equals 2 x RSD. For further information please visit [www.eurofins.dk/uncertainty](http://www.eurofins.dk/uncertainty).

## 6.8 Decision Rules

Eurofins Product Testing A/S, declare statement of conformity based on the "Binary Statement for Simple Acceptance Rule" described in ILAC's "Guidelines on decision Rules and Statements of Conformity" ILAC-G8:09/2019.

This means that results above the detection limit are always reported with two significant digits. Results are evaluated with the same number of significant digits as the corresponding limit values, and conformity is based on results being less than or equal to limit values.

For limit values with more than two significant digits, the third digit will be used to confirm whether a result is below or equal to the limit value. It will always be indicated in the evaluation table if this expanded evaluation is performed.

For further information please visit [www.eurofins.dk/product-testing/om-os/beslutningsregler/](http://www.eurofins.dk/product-testing/om-os/beslutningsregler/)

## 6.9 Version History

| Report date | Report number          | Modification    |
|-------------|------------------------|-----------------|
| 19/04/2022  | 392-2021-00105501_M_EN | Current version |