

AKEMI - Chemisch Technische Spezialfabrik GmbH  
Lechstraße 28  
90451 Nürnberg  
GERMANY

Eurofins Product Testing A/S  
Smedeskovvej 38  
8464 Galten  
Denmark

CustomerSupport@eurofins.com  
www.eurofins.com/VOC-testing

## VOC EMISSION TEST REPORT


### French VOC Regulation

21 December 2021

#### 1 Sample Information

|                        |                 |
|------------------------|-----------------|
| Sample name            | Transformer Max |
| Batch no.              | 33523521        |
| Stated production date | 31/08/2021      |
| Product type           | Sealer          |
| Sample reception       | 20/10/2021      |

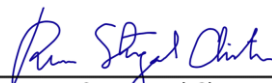
#### 2 Brief Evaluation of the Results

| Regulation or protocol | Conclusion  | Version of regulation or protocol  |
|------------------------|---|--|
| French VOC Regulation  |  | Decree of March 2011 (DEVL1101903D) and Arrêté of April 2011 (DEVL1104875A) modified in February 2012 (DEVL1133129A) |
| French CMR components  | Pass  | Regulation of April and May 2009 (DEVP0908633A and DEVP0910046A)   |

Full details based on the testing and direct comparison with limit values are available in the following pages  
Regarding pass/fail decision rule please see appendix



Rasmus Verdier  
Analytical Service Manager



Rasmus Stengaard Christensen  
Analytical Service Manager, MSc in Chemistry

## Table of contents

|          |   |          |
|----------|---|----------|
| <b>1</b> | <b>Sample Information</b>                                 | <b>1</b> |
| <b>2</b> | <b>Brief Evaluation of the Results</b>                    | <b>1</b> |
| <b>3</b> | <b>Applied Test Methods</b>                               | <b>3</b> |
| 3.1      | General Test References                                   | 3        |
| 3.2      | Specific Laboratory Sampling and Analyses                 | 3        |
| <b>4</b> | <b>Test Parameters, Sample Preparation and Deviations</b> | <b>4</b> |
| 4.1      | VOC Emission Chamber Test Parameters                      | 4        |
| 4.2      | Preparation of the Test Specimen                          | 4        |
| 4.3      | Picture of Sample   | 4        |
| 4.4      | Deviations from Referenced Protocols and Regulations      | 4        |
| <b>5</b> | <b>Summary and Evaluation of the Results</b>              | <b>5</b> |
| 5.1      | Comparison with Limit Values of the French VOC Regulation | 5        |
| 5.2      | Comparison with Limit Values of the CMR Components        | 5        |
| <b>6</b> | <b>Appendices</b>   | <b>6</b> |
| 6.1      | Chromatogram of VOC Emissions after 28 Days               | 6        |
| 6.2      | How to Understand the Results                             | 7        |
| 6.3      | Description of VOC Emission Test                          | 8        |
| 6.4      | Quality Assurance   | 8        |
| 6.5      | Accreditation   | 9        |
| 6.6      | Uncertainty of the Test Method                            | 9        |
| 6.7      | Decision Rules  | 9        |
| 6.8      | Version History   | 9        |

### 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  | -  | -                   | -  |
| French VOC Classes               | Decree of 03/2011 (DEVL1101903D) and arrêté of 02/2012 (DEVL1133129A) | 2  | Toluene equivalents | 22%  |
| French CMR                       | Regulation of April and May 2009 (DEVP0908633A and DEVP0910046A)      | 1  | Toluene equivalents | 22%  |

#### 3.2 Specific Laboratory Sampling and Analyses

| Procedure                | External Method   | Internal SOP | Quantification limit / sampling volume | Analytical principle    | Uncertainty <sup>a</sup> [RSD(%)] |
|--------------------------|---|--------------|--|-------------------------|-----------------------------------|
| Sample preparation       | ISO 16000-11:2006, 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%                               |
| Sampling of phthalates*  | ISO 16000-33:2017, MEL-09:2003                                    | 71M549812    | 60 L                                   | XAD-2                   | -                                 |
| Analysis of phthalates*  | ISO 16000-33:2017   | 71M546060    | 0.6 $\mu\text{g}/\text{m}^3$           | GC/MS                   | 10%                               |

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

This report may only be copied or reprinted in its entirety.

## 4 Test Parameters, Sample Preparation and Deviations

### 4.1 VOC Emission Chamber Test Parameters

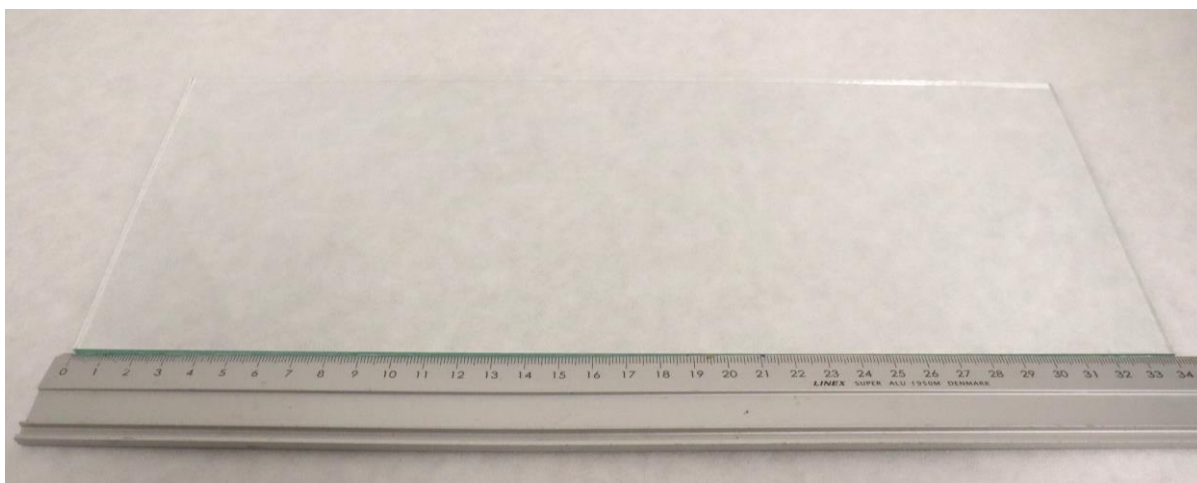
| Parameter  | Value  | Parameter  | Value                   |
|--|--------|--|-------------------------|
| Chamber volume, V[L]   | 119    | Preconditioning period                           | -                       |
| Air Change rate, n[h <sup>-1</sup> ]   | 0.5    | Chamber test period                              | 15/11/2021 - 13/12/2021 |
| Area specific ventilation rate, q [m/h or m <sup>3</sup> /m <sup>2</sup> /h] | 1.25   | Analytical test period                           | 15/11/2021 - 20/12/2021 |
| Relative humidity of supply air, RH [%]                                      | 50 ± 3 | Loading factor [m <sup>2</sup> /m <sup>3</sup> ] | 0.4                     |
| Temperature of supply air, T [°C]  | 23 ± 1 | Test scenario                                    | Flooring or ceiling     |

### 4.2 Preparation of the Test Specimen

The sample was homogenised and applied onto a glass plate.

| Number of Layers | Application amount, g/m <sup>2</sup> | Drying time, h |
|------------------|--------------------------------------|----------------|
| 1                | 30                                   | -              |

### 4.3 Picture of Sample




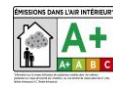


### 4.4 Deviations from Referenced Protocols and Regulations

No deviations from the referenced test methods were observed.

## 5 Summary and Evaluation of the Results

### 5.1 Comparison with Limit Values of the French VOC Regulation

|                        | CAS No.   | Conc.<br>28 days<br>$\mu\text{g}/\text{m}^3$ | <br>$\mu\text{g}/\text{m}^3$ | <br>$\mu\text{g}/\text{m}^3$ | <br>$\mu\text{g}/\text{m}^3$ | <br>$\mu\text{g}/\text{m}^3$ |
|------------------------|-----------|--|--|---|---|---|
| TVOC                   | -         | < 2  | > 2000   | < 2000  | < 1500  | < 1000  |
| Formaldehyde           | 50-00-0   | < 3  | > 120  | < 120   | < 60  | < 10  |
| Acetaldehyde           | 75-07-0   | < 3  | > 400  | < 400   | < 300   | < 200   |
| Toluene                | 108-88-3  | < 2  | > 600  | < 600   | < 450   | < 300   |
| Tetrachloroethylene    | 127-18-4  | < 2  | > 500  | < 500   | < 350   | < 250   |
| Ethylbenzene           | 100-41-4  | < 2  | > 1500   | < 1500  | < 1000  | < 750   |
| Xylene                 | 1330-20-7 | < 2  | > 400  | < 400   | < 300   | < 200   |
| Styrene                | 100-42-5  | < 2  | > 500  | < 500   | < 350   | < 250   |
| 2-Butoxyethanol        | 111-76-2  | < 2  | > 2000   | < 2000  | < 1500  | < 1000  |
| 1,2,4-Trimethylbenzene | 95-63-6   | < 2  | > 2000   | < 2000  | < 1500  | < 1000  |
| 1,4-Dichlorobenzene    | 106-46-7  | < 2  | > 120  | < 120   | < 90  | < 60  |

The product was assigned a VOC emission class without taking into account the measurement uncertainty associated with the result. As specified in French Decree no. 2011-321 of March 23 2011, correct assignment of the VOC emission class is the sole responsibility of the party responsible for distribution of the product in the French market.

### 5.2 Comparison with Limit Values of the CMR Components

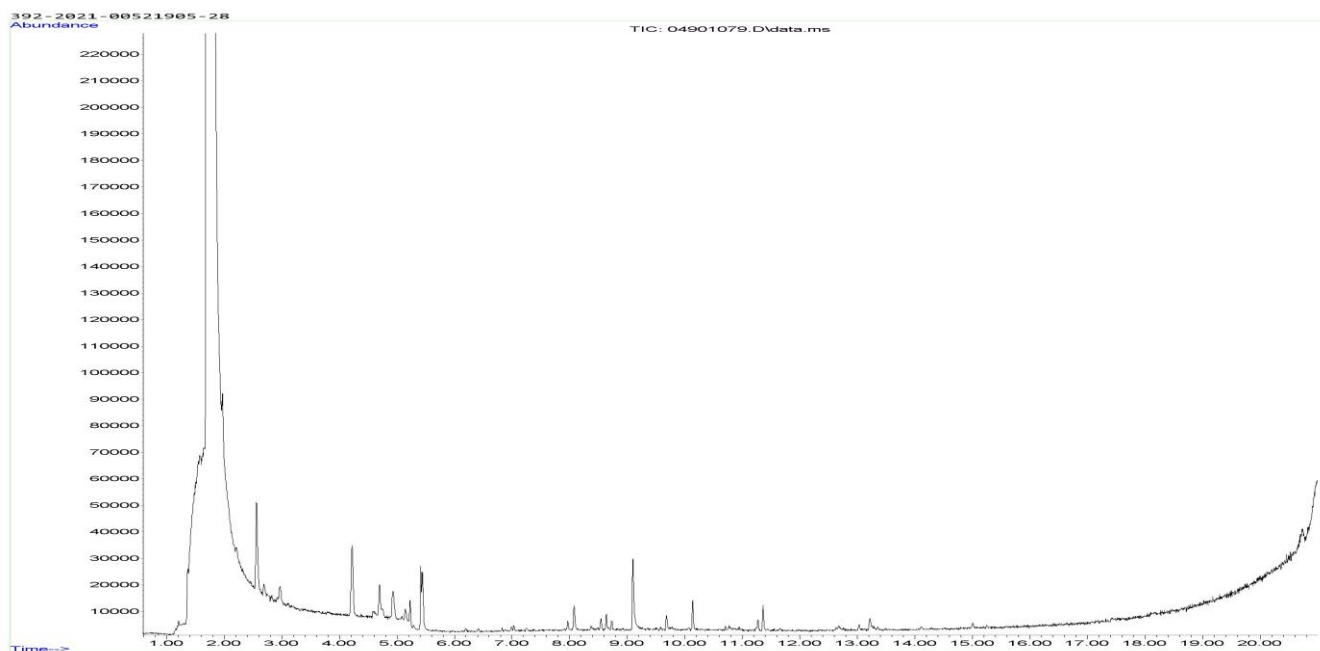
| CMR (French reg.)             | CAS No.  | Conc.<br>28 days<br>$\mu\text{g}/\text{m}^3$ | Max. allowed air concentration<br>$\mu\text{g}/\text{m}^3$ |
|-------------------------------|----------|--|--|
| Benzene                       | 71-43-2  | < 1  | < 1  |
| Trichloroethylene             | 79-01-6  | < 1  | < 1  |
| Dibutylphthalate (DBP)*       | 84-74-2  | < 1  | < 1  |
| Diethylhexylphthalate (DEHP)* | 117-81-7 | < 1  | < 1  |

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

This report may only be copied or reprinted in its entirety.

## 6 Appendices

### 6.1 Chromatogram of VOC Emissions after 28 Days



## 6.2 How to Understand the Results

### 6.2.1 Acronyms Used in the Report

|     |  |
|-----|--|
| <   | Means less than  |
| >   | Means bigger than  |
| *   | Not a part of our accreditation  |
| ±   | 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   |

## 6.3 Description of VOC Emission Test

### 6.3.1 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).

### 6.3.2 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).

### 6.3.3 Testing of VOC

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).

All eight substances are identified if present. Quantification above 2 µg/m<sup>3</sup> is done using the TIC signal and authentic response factors.

Total Volatile Organic Compounds (TVOC) is calculated by summation of all individual VOCs with a concentration ≥ 2 µg/m<sup>3</sup>. The TVOC is expressed in toluene equivalents as defined in EN 16516 and similar to ISO 16000-6.

### 6.3.4 Testing of Aldehydes

The presence of aldehydes 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.

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.

### 6.3.5 Testing of Phthalates

The presence of phthalates is tested by drawing air samples from the test chamber outlet through tube with XAD-II adsorbent after the specified duration of storage in the ventilated test chamber. Analysis is performed by solvent desorption and subsequently by GC/MS. Analysis of phthalates is not currently covered by the accreditation (Internal methods no.: 71M549812 / 71M546060).

## 6.4 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.

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

This report may only be copied or reprinted in its entity.



## 6.5 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.

## 6.6 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).

## 6.7 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/)

## 6.8 Version History

| Report date | Report number          | Modification    |
|-------------|------------------------|-----------------|
| 21/12/2021  | 392-2021-00521905_E_EN | Current version |