eco-INSTITUT Germany GmbH

Laborprüfung
Laboratory testing

Técnicas Expansivas S.L. | ESB26220491
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Segador 13, 26006 | Logrono (La Rioja)
SPAIN

# Test Report No. 55002-004 II

| | |
|---|---|
| **Test objective:** | **Evaluation according to French VOC- and CMR-regulation** |
| **Sample description by client:** | **SI-UNI** |
| Sampled by: | Belki Leonor Parada Diaz |
| Date of sampling: | 14.01.2020 |
| Location of sampling: | at the client |
| Date of production: | 07.01.2020 |
| Date of arrival of sample: | 20.01.2020 |
| Test period: | 20.01.2020 - 19.03.2020 |
| Date of report: | 23.03.2020 |
| Number of pages of report: | 15 |
| Testing laboratory: | eco-INSTITUT Germany GmbH, Cologne<br>except ‡ subcontracted<br># outside accreditation |
| 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. More information at www.eco-institut.de/en/advertising |

# Content



# Sample View

| Internal Sample-no. | Description by customer | Condition upon delivery | Type of sample |
|---|---|---|---|
| A004 | SI-UNI | without objection | acetic silicone sealant |

A004: SI-UNI

# Evaluation#

The product **SI-UNI** has been tested on behalf of **Técnicas Expansivas S.L.**.

This evaluation bases on the test criteria of the decree no. 2011-321 of March 23rd, 2011 (VOC regulation) and executive decisions of May 28th, 2009 and April 30th, 2009 (CMR regulation) of the French Ministry of Ecology, Sustainable Development, Transport and Housing.

The results documented in the test report were evaluated as follows.[1]

## VOC regulation

| Emission analysis | Concentration (Test chamber air) [µg/m³] | Class | | | |
|---|---|---|---|---|---|
| **Substance** | **after 28 days** | **C** | **B** | **A** | **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 | < 1 | > 500 | < 500 | < 350 | < 250 |
| **$TVOC_{tol}$** | 1100 | **> 2000** | **< 2000** | **< 1500** | **< 1000** |

## CMR regulation

| Emission analysis | Concentration (Test chamber air) [µg/m³] | Requirement [µg/m³] |
|---|---|---|
| **Substance** | **after 28 days** | **after 28 days** |
| Benzene | < 1 | < 1 |
| Trichlorethylene | < 1 | < 1 |
| Di(2-ethylhexyl)phthalate (DEHP) | < 1 | < 1 |
| Dibutylphthalate (DBP) | < 1 | < 1 |

[1] 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 ≥ 50%. Similarly, a result slightly below the specification value also only has a probability of ≥ 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/).

## Summary evaluation#

The product **SI-UNI** meets the requirements of the **Class A** of the decree no. 2011-321 of March 23, 2011 (VOC regulation) and executive decisions of May 28th, 2009 and April 30th, 2009 (CMR regulation) of the French Ministry of Ecology, Sustainable Development, Transport and Housing.

Cologne, 23.03.2020

Marc-Anton Dobaj, M.Sc. Crystalline Materials
(Project Manager)

# Evaluation#

Le produit **SI-UNI** a été testé sous la responsabilité du **Técnicas Expansivas S.L.**.
Cette évaluation est basée sur les critères du décret n° 2011-321 du 23 mars 2011 (COV décret) et arrêté du 28 mai 2009 et 30 avril 2009 (CMR arrêté) 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.[2]

## COV décret

| Analyse des émissions | Concentration (air de la chambre d'essai) [µg/m³] | Classe | | | |
|---|---|---|---|---|---|
| **Substance** | **au bout de 28 jours** | **C** | **B** | **A** | **A+** |
| 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 | < 1 | > 500 | < 500 | < 350 | < 250 |
| **$COVT_{tol}$** | 1100 | **> 2000** | **< 2000** | **< 1500** | **< 1000** |

## CMR arrêté

| Analyse des émissions | Concentration (air de la chambre d'essai) [µg/m³] | Valeur limite [µg/m³] |
|---|---|---|
| **Substance** | **au bout de 28 jours** | **au bout de 28 jours** |
| Benzène | < 1 | < 1 |
| Trichloréthylène | < 1 | < 1 |
| Phthalate de bis (2-éthylhexle) (DEHP) | < 1 | < 1 |
| Phthalat de dibutyle (DBP) | < 1 | < 1 |

[2] 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 ≥ 50 % De même, un résultat légèrement inférieur à la valeur requise n'est conforme qu'avec une probabilité de ≥ 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-institut.de/en/2019/07/measurement_uncertainty/).

# Résumé d'évaluation#

Le produit **SI-UNI** correspond aux exigences de la **classification A** sur les critères du décret n° 2011-321 du 23 mars 2011 (COV décret) et arrêté du 28 mai 2009 et 30 avril 2009 (CMR arrêté) par le Ministère de l'écologie, du développement durable, des transports et du logement.

Cologne, 23.03.2020

Marc-Anton Dobaj, M.Sc. Crystalline Materials
(Chef de projet)

# Laboratory report

## 1 Emission analysis

### Test method

| | |
|---|---|
| DIN EN 16516:2018-01 | Testing and evaluation of the release of dangerous substances; determination of emissions into indoor air |

### A004, Preparation of test sample

| | |
|---|---|
| Date: | 17.02.2020 |
| Pre-treatment: | Filled in aluminium tray; surface smoothed with a straight trowel; width: 10 mm, depth: 3 mm; transfer of the test specimen into the test chamber immediately after preparation |
| Masking of backside: | not applicable |
| Masking of edges: | yes, 100% |
| Relationship of unmasked edges to surface: | not applicable |
| Loading: | related to area |
| Dimensions: | 8.75 cm x 1 cm [depth: 3 mm] |

### A004, Test chamber conditions according to DIN ISO 16000-9:2008-04

| | |
|---|---|
| Chamber volume: | 0.125 $m^3$ |
| Temperature: | 23°C ± 1°C |
| Relative humidity: | 50 % ± 1 % |
| Air pressure: | normal |
| Air: | cleaned |
| Air change rate: | 0.5 $h^{-1}$ |
| Air velocity: | 0.3 m/s |
| Loading: | 0.007 $m^2/m^3$ |
| Specific air flow rate: | 71.4 $m^3/(m^2 \cdot h)$ |
| Air sampling: | 28 days after test chamber loading |

### Analytics

| | |
|---|---|
| Aldehydes and Ketones | DIN ISO 16000-3:2013-01 |
| Limit of determination: | 2 µg/$m^3$ |
| Volatile Organic Compounds | DIN ISO 16000-6:2012-11 |
| Limit of determination: | 1 µg/$m^3$ (1,4-Cyclohexanedimethanol, Diethylene glycol, 1,4-Butanediol: 5 µg/$m^3$) |
| Note for analysis: | not specified |

## 1.1 Sample A004, 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) and „Arrêté du 30 avril 2009 relatif aux conditions de mise sur le marché des produits de construction et de décoration contenant des substances cancérigènes, mutagènes ou reprotoxiques de catégorie 1 ou 2" (french CMR-regulation, 2 substances), test chamber, air sampling 28 days after test chamber loading

**Test result:**

Sample: | A004: SI-UNI

| No. | Substance | CAS No. | RT [min] | Concentration+ (test chamber air) Substances ≥ 1 µg/m³ 28 days [µg/m³] | Toluene-equivalent Substances ≥ 5 µg/m³ 28 days [µg/m³] |
|---|---|---|---|---|---|
| **1** | **Aromatic hydrocarbons** | | | | |
| 1-1 | Toluene | 108-88-3 | | < 1 | < 5 |
| 1-2 | Ethyl benzene | 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 | | < 1 | < 5 |
| **6** | **Glycols, Glycol ethers, Glycol esters** | | | | |
| 6-3 | Ethylene glycol-monobutylether (2-Butoxyethanol) | 111-76-2 | | < 1 | < 5 |
| **7** | **Aldehyde** | | | | |
| 7-20 | Acetaldehyde | 75-07-0 | | < 2 | n.d. |
| 7-22 | Formaldehyde | 50-00-0 | | < 2 | n.d. |
| **13** | **Other identified substances in addition to LCI list** | | | | |
| | Benzene | 71-43-2 | | < 1 | < 5 |
| | 1,4-Dichlorobenzene | 106-46-7 | | < 1 | < 5 |
| | Trichlorethene | 79-01-6 | | < 1 | < 5 |
| | Tetrachloroethene | 127-18-4 | | < 1 | < 5 |

+ identified and calibrated substances, substance specific calculated

n.d. = not determinable

| TVOC, Total volatile organic compounds | Concentration after 28 days [µg/m³] | SERa [µg/(m² • h)] |
|---|---|---|
| Sum of VOC according to ISO 16000-6 | 1100 | 79000 |

## 2 Phthalates, chamber air analytics

**Test parameter:**
Phthalates, test chamber, air sampling 28 days after test chamber loading

**Test method:**

| | |
|---|---|
| Analytics: | DIN ISO 16000-6:2012-11 |

**Test result:**

| Sample | Substance | Concentration (test chamber air) [µg/m³] | Limit of determination (test chamber air) [µg/m³] |
|---|---|---|---|
| A004: SI-UNI | Dibutylphthalate (DBP) | < q.l. | 1 |
| | Diethylhexylphthalate (DEHP) | < q.l. | 1 |

< q.l. = Value below quantification limit

Cologne, 23.03.2020

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

# Appendix

## I Sampling sheet

See the original test report 55002-004 from 23.03.2020.

## II Definition of terms

| | |
|---|---|
| VOC<br>(volatile organic compounds) | All individual compounds with a concentration ≥ 1 µg/m³ in the retention range $C_6$ (n-Hexane) to $C_{16}$ (n-Hexadecane) |
| TVOC | Total volatile organic compounds |
| TVOC according to<br>DIN EN 16516:2018-01 | Sum of all VOC ≥ 5 µg/m³ in the retention range $C_6$ to $C_{16}$, calculated as toluene equivalent |
| TVOC according to AgBB/DIBt | Sum of all identified and calibrated VOC ≥ 5 µg/m³,<br>SVOC ≥ 5 µg/m³ with LCI and not calibrated VOC ≥ 5 µg/m³<br>calculated as toluene equivalent |
| TVOC according to eco-INSTITUT-Label | Sum of all identified and calibrated VOC ≥ 1 µg/m³,<br>SVOC ≥ 5 µg/m³ with LCI and not calibrated VOC ≥ 1 µg/m³<br>calculated as toluene equivalent |
| TVOC according to ISO 16000-6:2012-11 | Total area of chromatogram in the retention range $C_6$ to $C_{16}$, calculated as toluene equivalent |
| TVOC without LCI according to AgBB/DIBt and Belgian regulation | Sum of all VOC without NIK ≥ 5 µg/m³ in the retention range $C_6$ to $C_{16}$ |
| TVOC without LCI according to eco-INSTITUT-Label | Sum of all VOC without NIK ≥ 1 µg/m³ in the retention range $C_6$ to $C_{16}$ |
| CMR-VOC<br>(carcinogenic, mutagenic, reproduction-toxic VOC, VVOC and SVOC) | All individual substances with the following categories:<br>Regulation (EC) No. 1272/2008: Category Car.1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B<br>TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B<br>IARC: Group 1 and 2A<br>DFG (MAK lists): Category III1and III2 |
| VVOC<br>(very volatile organic compounds) | All individual substances with a concentration ≥ 1 µg/m³ in the retention range < $C_6$ |
| TVVOC | Total very volatile organic compounds |
| TVVOC according to AgBB/DIBt and Belgian regulation | Sum of all identified and calibrated VVOC ≥ 5 µg/m³ with LCI |
| TVVOC according to eco-INSTITUT-Label | Sum of all identified and calibrated VVOC ≥ 1 µg/m³ with LCI |
| SVOC (semi volatile organic compounds) | All individual substances ≥ 1 µg/m³ in the retention range $C_{16}$ to $C_{22}$ |
| TSVOC | Total semi volatile organic compounds |
| TSVOC according to DIN EN 16516:2018-01 | Sum of all SVOC in the retention range $C_{16}$ to $C_{22}$, calculated as toluene equivalent |
| TSVOC without LCI according to AgBB/DIBt | Sum of all SVOC ≥ 5 µg/m³ without LCI |
| TSVOC without LCI according to eco-INSTITUT-Label | Sum of all SVOC ≥ 1 µg/m³ without LCI |
| TSVOC with LCI according to AgBB/DIBt | Sum of all identified and calibrated SVOC ≥ 5 µg/m³ with LCI |
| SER | Specific emission rate (see appendix IV) |
| LCI value | Lowest Concentration of Interest; calculated value for the evaluation of VOC, established by the Committee for Health-related Evaluation of Building Products (Ausschuss zur gesundheitlichen Bewertung von Bauprodukten - AgBB) |

| | |
|---|---|
| R value | The quotient of the concentration and the LCI value is generated for every substance which is detected in the test chamber air. The sum of the calculated quotients results in the R value. |
| R value according to eco-INSTITUT-Label | R value for all identified and calibrated VOC ≥ 1 µg/m³ with LCI, established by the AgBB in 2018 |
| R value according to AgBB 2018/DIBt | R value for all identified and calibrated VOC ≥ 5 µg/m³ with LCI, established by the AgBB in 2018 |
| R value according to Belgian regulation | R value for all identified and calibrated VOC ≥ 5 µg/m³ with LCI, established by the Belgian regulation |
| R value according to AFSSET | R value for all identified and calibrated VOC ≥ 5 µg/m³ with LCI, established by ANSES (French National Agency on Food Safety, Environment, and Workplace Security) |
| RT (retention time) | Time for a particular analyte to pass through the system (from the column inlet to the detector) |
| CAS No. (Chemical Abstracts Service) | International unique numerical identifier for a chemical substance |
| Toluene equivalent | Concentration, calculated as toluene equivalent |

# III 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 with an air flow rate of 100 mL/min for Tenax and approx. 100 L with an air flow rate of 0.8 L/min for DNPH (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.

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 signa of the standard d8 toluene. As far as feasible, identification and quantification limit of any substance shall be 1 µg per $m^3$ for substances adsorbed on Tenax and 2 µg/$m^3$ for DNPH-derivatized substances (limit of quantification).

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 16516:2018-01. 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.

# IV 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 ($m^2$) | relation between emission and surface |
| v = unit volume ($m^3$) | 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 | $SER_l$ | in µg/(m·h) |
| surface-specific | $SER_a$ | in µg/($m^2$·h) |
| volume-specific | $SER_v$ | in µg/($m^3$·h) |
| unit specific | $SER_u$ | 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.

$$SER = q \cdot c$$

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.