

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

Test Report No. 55002-003 II

Test objective:	Evaluation according to French VOC- and CMR-regulation
Sample description by client:	MS-SF
Sampled by:	Belki Leonor Parada Diaz
Date of sampling:	14.01.2020
Location of sampling:	at the client
Date of production:	01.11.2019
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 except ‡ subcontracted # 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

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Sample View

Internal Sample-no.	Description by customer	Condition upon delivery	Type of sample
A003	MS-SF	without objection	hybrid adhesive



A003: MS-SF

Evaluation[#]

The product **MS-SF** 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}	19	> 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 $\geq 50\%$. Similarly, a result slightly below the specification value also only has a probability of $\geq 50\%$ 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 **MS-SF** 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

A handwritten signature in black ink, reading "M.-A. Dobaj", with a long, sweeping horizontal stroke extending to the right.

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

Evaluation[#]

Le produit **MS-SF** 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
COV _{tot}	19	> 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-éthylhexyle) (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 $\geq 50\%$. De même, un résultat légèrement inférieur à la valeur requise n'est conforme qu'avec une probabilité de $\geq 50\%$. 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 **MS-SF** 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

A handwritten signature in black ink, reading "M.-A. Dobaj", with a long, sweeping horizontal stroke extending to the right.

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

A003, 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]

A003, 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 · 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 A003, 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: | A003: MS-SF

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	19	1400

2 Phthalates, chamber air analytics

Test parameter:

Phthalates, test chamber, air sampling 28 days after test chamber loading

Test method:

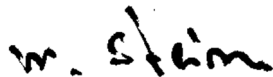
Analytics: | DIN ISO 16000-6:2012-11

Test result:

Sample	Substance	Concentration (test chamber air) [µg/m³]	Limit of determination (test chamber air) [µg/m³]
A003: MS-SF	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 55002-003 from 23.03.2020.

II Definition of terms

VOC (volatile organic compounds)	All individual compounds with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range C_6 (n-Hexane) to C_{16} (n-Hexadecane)
TVOC	Total volatile organic compounds
TVOC according to DIN EN 16516:2018-01	Sum of all VOC $\geq 5 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$, SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI and not calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ calculated as toluene equivalent
TVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$, SVOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI and not calibrated VOC $\geq 1 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$ in the retention range C_6 to C_{16}
TVOC without LCI according to eco-INSTITUT-Label	Sum of all VOC without NIK $\geq 1 \mu\text{g}/\text{m}^3$ in the retention range C_6 to C_{16}
CMR-VOC (carcinogenic, mutagenic, reproduction-toxic VOC, VVOC and SVOC)	All individual substances with the following categories: Regulation (EC) No. 1272/2008: Category Car.1A and 1B, Muta. 1A and 1B, Repr. 1A and 1B TRGS 905: K1A, K1B, M1A, M1B, R1A, R1B IARC: Group 1 and 2A DFG (MAK lists): Category III1 and III2
VVOC (very volatile organic compounds)	All individual substances with a concentration $\geq 1 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$ with LCI
TVVOC according to eco-INSTITUT-Label	Sum of all identified and calibrated VVOC $\geq 1 \mu\text{g}/\text{m}^3$ with LCI
SVOC (semi volatile organic compounds)	All individual substances $\geq 1 \mu\text{g}/\text{m}^3$ 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 $\geq 5 \mu\text{g}/\text{m}^3$ without LCI
TSVOC without LCI according to eco-INSTITUT-Label	Sum of all SVOC $\geq 1 \mu\text{g}/\text{m}^3$ without LCI
TSVOC with LCI according to AgBB/DIBt	Sum of all identified and calibrated SVOC $\geq 5 \mu\text{g}/\text{m}^3$ 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 $\geq 1 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2018
R value according to AgBB 2018/DIBt	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the AgBB in 2018
R value according to Belgian regulation	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ with LCI, established by the Belgian regulation
R value according to AFSSET	R value for all identified and calibrated VOC $\geq 5 \mu\text{g}/\text{m}^3$ 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 signal of the standard d8 toluene. As far as feasible, identification and quantification limit of any substance shall be 1 µg per m³ for substances adsorbed on Tenax and 2 µg/m³ 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.