REPORT

Issued by an Accredited Testing Laboratory

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Date	Reference	Page
2022-11-21	O100152-1146870	1 (5)

Zilence AB
Arabygatan 49
352 46 VÄXJÖ

Text

Emission measurements after 28 days

(2 appendices)

Object

One sample of an acoustic panel was delivered to RISE by the customer.

Product name:	**Akustikpanel**
Production date:	2022-09-01
Size of sample:	20 x 615 x 900mm
Date of sampling:	2022-09-07
Date of arrival to RISE:	2022-09-09
Date of analysis:	week 37 - 46

Assignment

Emission measurement according to ISO 16000-9:2006 (Indoor air – Part 9: Determination of the emission of volatile organic compounds from building products and furnishing – Emission test chamber method), after 28 days regarding volatile organic compounds (VOC and VVOC/SVOC), carcinogenic substances (VOC-substances, EU Regulation No 1272/2008 Annex VI, cat 1A and 1B) and aldehydes (ISO 16000-3:2022). Reference room calculations according to EN 16516:2017/A1:2020 (EU-LCI values).

Method

The test was started 2022-09-16 by unwrapping test samples. Backside was sealed with aluminium foil and aluminium tape.

The specimen was immediately after application placed in a separate conditioning container (with air velocity of ca 0.2 m/s) in a room with controlled climate conditions of 23 ± 2°C and 50 ± 5 % RH. Air samplings after 28 days of conditioning were carried out on 2022-10-14.

Test conditions in the chamber:

Chamber volume:	1.0 m^3
Temperature:	23 ± 1.0 °C
Relative humidity:	50 ± 3 % RH
Surface area of test specimen:	0.6 m^2
Air exchange rate:	0.5 h^{-1}
Area specific air flow rate:	0.82 m^3/m^2 h
Air velocity at specimen surface:	0.1 – 0.3 m/s

Tenax TA was used as adsorption medium for VOC. The tubes were thermally desorbed and analysed in accordance with ISO 16000-6:2011 (Determination of volatile organic compounds in indoor and test chamber air by active sampling on Tenax TA sorbent, thermal desorption and gas chromatography using MS or MS/FID). This means an analysis in a gas chromatograph and detection with a flame ionisation detector (FID) and mass selective detector (MS). The capillary column used is coated with 5% phenyl/ 95 % methylpolysiloxane. The FID signals are used for compound quantification. The total volatile organic compounds (TVOC) means compounds eluting between and including n-hexane to hexadecane, having boiling points in the range of about 70-260 °C. Minimum duplicate air samples were taken and the results are mean values. Sampled volumes are 5 to 6 L.

Tenax TA was also used as adsorption medium for testing of volatile carcinogenic compounds according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B), (exclusive formaldehyde), 1 µg/m^3 and above.

The samplings of aldehydes were carried out with DNPH samplers. The samplers were analysed according to ISO 16000-3:2022(Indoor air - Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method). This means analysis on a liquid chromatograph with absorbance detector. Duplicate air samples were taken and the results are mean values. Sampled volumes were 46 to 62 L.

Results

The results relate only to the items tested.

The results in Table 1 are expressed as area specific emission rates and as concentrations in a reference room (according to EN 16516:2017/A1, not accredited method). The reference room has a base area of 3 m x 4 m and a height of 2.5 m, with an air exchange rate of 0.5 h^{-1}. The wall area is 31.4 m^2, floor area is 12 m^2, small area, like a door, is 1.6 m^2 and very small area, like sealant, is 0.2 m^2. Wall area is used for the calculation of the concentrations.

Calculation of the concentration from the emission rate:

$$C = \frac{E_a \times A}{n \times V}$$

C = concentration of VOC in the reference room, in µg/m^3
E_a = area specific emission rate, in µg/m^{2}h
A = surface area of product in reference room, in m^2
n = air exchange rate, in changes per hour, here 0.5 h^{-1}
V = volume of the reference room, in m^3, here 30 m^3

Table 1.
Emission results of **Akustikpanel** after 28 days

Volatile organic compounds	CAS number	Retention time (min)	ID[1]	Emission rate (µg/unit h)	Concentration in reference room (µg/m³)	LCI_i (µg/m³)	R_i (c_i/LCI_i)
TVOC ($C_6 - C_{16}$)	--	6.2 – 38	B	40	83	--	--
Volatile Carcinogens [2]		6.2 – 38					
No substances detected	--	--	B	< 1	< 1	--	--
VOC with LCI [3]		6.2 – 38					
Acetic acid (VVOC)	64-19-7	6.2	A	55	120	1200	0.096
Propylene Glycol	57-55-6	9.4	A	21	44	2100	0.02
1-Hexanol, 2-ethyl-	104-76-7	20.1	A	8	16	3000	0.05
∑ **VOC with LCI**	--	--	A	84	180	--	
VOC without LCI [4]		6.2 – 38					
Cyclotrisiloxane, hexamethyl-	541-05-9	11.7	B	4	7	--	--
∑ **VOC without LCI**	--	--	B	4	7	--	--
SVOC ($C_{16} - C_{22}$) [5]		38 - 51					
No substances detected	--	--	B	< 2	< 5	--	--
∑ **SVOC**	--	--	B	< 2	< 5	--	--
VVOC (< C_6) [6]		5.2 – 6.2					
Formaldehyde [7]	50-00-0	--	A	46	95	100	0.95
Acetaldehyde [7]	75-07-0	--	A	< 2	< 5	300	--
∑ **VVOC**	--	--	A	46	95	--	
R = ∑ C_i / LCI_i [8]	--	--	--	--	--	--	1.12

[1] ID: A = quantified compound specific, B = quantified as toluene equivalent
[2] Volatile carcinogens = VOCs according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B
[3] VOC with LCI = identified VOC-compound with LCI-value according to EU-LCI, Dec 2020
[4] VOC without LCI = VOC-compound without LCI-value or not identified.
[5] SVOC = semi-volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)
[6] VVOC = very volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)
[7] VVOC-aldehydes measured with DNPH samplers (ISO 16000-3)
[8] R_i is the ratio of c_i/LCI_i, where c_i is the concentration in the reference room for compound *i*.
All VVOC, VOC, SVOC and carcinogens with LCI are included in the calculation of R value.

Only the compounds with a concentration > 5 µg/m^3 in the reference room are listed in Table 1 (carcinogenic compounds ≥ 1 µg/m^3) and evaluated based on LCI (= lowest concentration of interest). TVOC expressed in µg/m^3 is the sum of all individual substances with concentrations ≥ 5 µg/m^3 in toluene equivalents.

Quantification limit for TVOC is 10 µg/m^{2}h. Measurement uncertainty for VOC is 15 % (rel) and for formaldehyde 36 % (rel). Background of TVOC in the empty chamber was below 20 µg/m^3 and is subtracted.

See Appendix 1 for a gas chromatogram (FID spectra) and Appendix 2 for a photo of the test specimen.

Summary of the test results

The test results are summarized in Table 2.

Table 2.
Summary of the emission results after 28 days of **Akustikpanel**

Compounds	**Emission rate** (µg/m^{2}h)	**Concentration in reference room** (wall scenario) (µg/m^3)
TVOC	40	83
∑ Carcinogenic VOCs	< 1	< 1
∑ VOC with LCI	84	180
∑ VOC without LCI	4	7
∑ VVOC	< 2	< 5
Formaldehyde	46	95
∑ SVOC	< 2	< 5
R = ∑ C_i / LCI_i	1.12	

Evaluation of the test results

The emission results can be compared to different Emission Labelling Systems.

Byggvarubedömningen (version 7.1, 2022-10-01) has criteria regarding Emissions of VOC to indoor environment. The emissions are to be measured according to a standard method such as ISO 16000-9 after 28 days regarding VOC and aldehydes. The requirements for the **Recommended class** are that the test results of TVOC, VOC and aldehydes are in compliance with the requirements of these parameters in one of the following systems: Emicode EC1, Emicode EC1^{PLUS}, Blue Angel, M1 (RTS) or GUT.

The results of the tested sample are compared to **M1** "M1 Emission Classification of Building Materials: Protocol for Chemical and Sensory Testing of Building Materials, ver 15.11.2017", see Table 3.

Decision rule: When comparing the measured results and requirement level, the average value of the measured results has been compared with the requirement level. No account is taken to the measurement uncertainty.

Table 4.
The test results of **Akustikpanel** compared to the relevant requirements in M1

Compounds	**Requirement M1** (mg/m^2h)	**Test Results** (mg/m^2h)	**Pass / Fail**
TVOC	< 0.2	**0.04**	**PASS**
Formaldehyde	< 0.05	**0.046**	**PASS**
CMR 1A+1B	< 0.001	**< 0.001**	**PASS**
Single VOC ($\mu g/m^3$)	≤ EU-LCI	**≤ EU-LCI**	**PASS**
Ammonia	< 0.03	not measured	--
Odour	≥ 0.0	not measured	--

Results of evaluation:

The test results are in compliance with the tested requirements of M1 and meet the requirements for the *Recommended class*.

RISE Research Institutes of Sweden AB
Chemistry and Applied Mechanics - Chemical Product Safety

Performed by

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Examined by

Conny Haraldsson

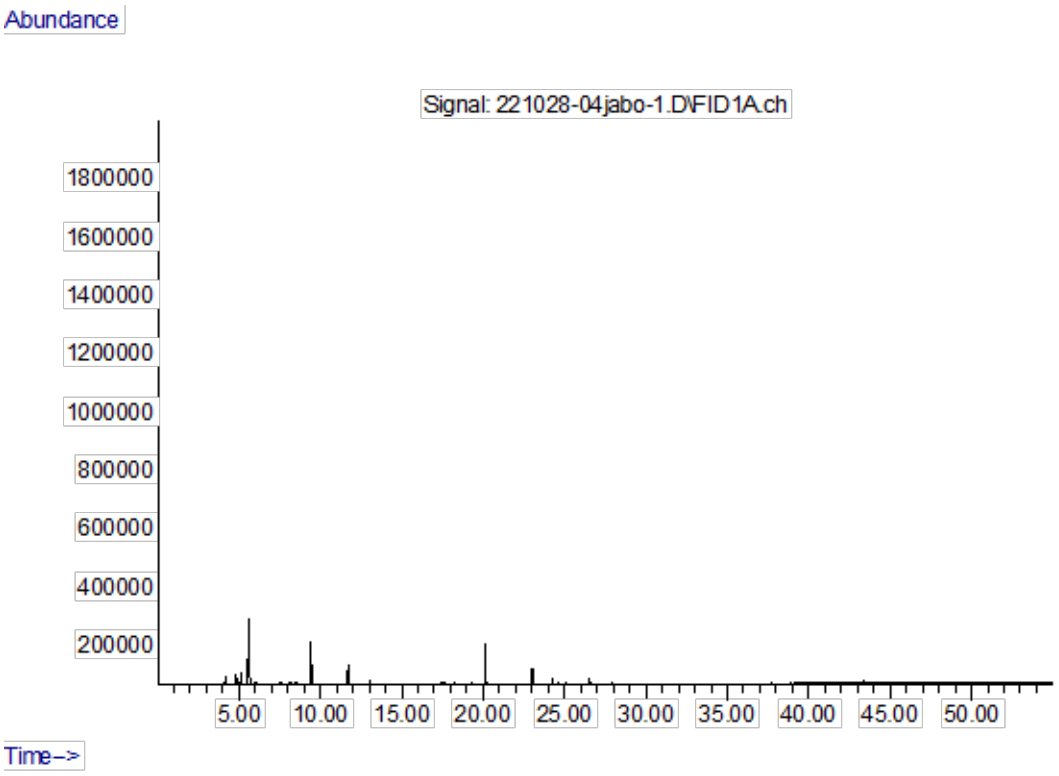
Appendices

1. Gas Chromatogram
2. Photo of the test specimen

Appendix 1

Gas chromatogram

Akustikpanel, after 28 days:



TVOC between C_6 and C_{16}, means compounds eluting between 6.9 and 39 minutes.

Appendix 2

Photo of the test specimen

Akustikpanel

Verification

Transaction 09222115557481851365

Document

O100152-1146870
Main document
7 pages
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Signing parties

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