# REPORT

issued by an Accredited Testing Laboratory

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| Date | Reference | Page |
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Testing

Akustikmiljö i Falkenberg AB
Daniel Magnusson
Box 77
311 21 Falkenberg

# Emission measurements after 28 days

(3 appendices)

## Object

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

| | |
|---|---|
| Product name: | **Akustikduk 80 – 130 g** |
| Production date: | 2018-01-03 |
| Size of sample: | 3 x 1 m |
| Date of arrival to RISE: | 2018-01-05 |
| Date of analysis: | week 2 - 8, 2018 |

## 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), formaldehyde and acetaldehyde (ISO 16000-3:2011). Evaluation according to EN 16516:2017 (EU-LCI values).

For evaluation of test results the principle of shared risk is applied, i.e. for a max limit (≤ ) a result ≤ the limit complies and a result > the limit does not comply (ILAC G8 section 2.7).

## Method

The test was started 2018-01-12. A piece of 0.5 x 0.8 m was cut out from the middle of the sample. The piece was folded and edges and parts of front sides were sealed with aluminium tape. The specimen was 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. The test specimen was placed into the chamber three days prior to air samplings. Air samplings after 28 days of conditioning were carried out on 2018-02-09.



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Test conditions in the chamber:

| | |
|---|---|
| Chamber volume: | 1.0 $m^3$ |
| Temperature: | 23 ± 0.5 $^oC$ |
| Relative humidity: | 50 ± 5 % RH |
| Surface area of test specimen: | 0.39 $m^2$ |
| Air exchange rate: | 0.5 $h^{-1}$ |
| Area specific air flow rate: | 1.3 $m^3/m^2$ 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 to RISE method 0601, similar to 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/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 2 to 7 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 RISE method 2302, similar to ISO 16000-3:2011(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 70 to 170 L.

## Results

The results in Table 1 are expressed as area specific emission rates and as concentrations in a reference room (according to EN 16516:2017). 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 **Akustikduk 80 – 130 g** after 28 days

| Volatile organic compounds | CAS number | Retention time (min) | ID[1] | Emission rate ($\mu g/m^2h$) | Concentration in reference room ($\mu g/m^3$) | $LCI_i$ ($\mu g/m^3$) | $R_i$ ($c_i/LCI_i$) |
|---|---|---|---|---|---|---|---|
| **TVOC** ($C_6 - C_{16}$) | -- | 6.5 – 38 | B | < 10 | < 10 | -- | -- |
| **Volatile Carcinogens** [2] | | 6.5 – 38 | | | | | |
| No substances detected | -- | -- | B | < 1 | < 1 | -- | -- |
| **VOC with LCI** [3] | | 6.5 – 38 | | | | | |
| No substances detected | -- | -- | B | < 2 | < 5 | -- | -- |
| ∑ **VOC with LCI** | -- | -- | A | < 2 | < 5 | -- | -- |
| **VOC without LCI** [4] | | | | | | | |
| No substances detected | -- | -- | B | < 2 | < 5 | -- | -- |
| ∑ **VOC without LCI** | -- | -- | B | < 2 | < 5 | -- | -- |
| **SVOC** ($C_{16} - C_{22}$) [5] | | 38 - 51 | | | | | |
| No substances detected | -- | -- | B | < 2 | < 5 | -- | -- |
| ∑ **SVOC** | -- | -- | B | < 2 | < 5 | -- | -- |
| **VVOC** ( < $C_6$) [6] | | 4.9 – 6.5 | | | | | |
| Formaldehyde [7] | 50-00-0 | -- | A | n.d. | < 5 | 100 | -- |
| Acetaldehyde [7] | 75-07-0 | -- | A | n.d. | < 5 | 1 200 | -- |
| ∑ **VVOC** | -- | -- | A | < 2 | < 5 | -- | -- |
| **R = ∑ $C_i$ / $LCI_i$** [8] | -- | -- | -- | -- | -- | -- | 0.03 |

[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 2016
[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)] All VVOC, VOC, SVOC and carcinogens with LCI
n.d. = not detected (detection limit is approx 1 $\mu g/m^2h$ ).

Only VOC-compounds with an emission rate higher than 4 $\mu g/m^2h$ are listed in Table 1, carcinogenic compounds ≥ 1 $\mu g/m^2h$. Only the compounds with a concentration in the reference room > 5 $\mu g/m^3$ are evaluated based on LCI (= lowest concentration of interest). TVOC expressed in $\mu g/m^3$ is the sum of all individual substances with concentrations ≥ 5 $\mu g/m^3$ (in toluene equivalents).

Quantification limit for TVOC is 10 $\mu g/m^2h$. Measurement uncertainty for VOC is 15 % (rel) and for formaldehyde 30 % (rel). Background of TVOC in the empty chamber was below 20 $\mu g/m^3$.

See Appendix 1 for a gas chromatogram (FID spectra) and Appendix 2 for a photo of the test specimen. Appendix 3 is the sampling report received from the customer.

## Summary of the test results

The test results are summarized in Table 2.

**Table 2.**
Summary of the emission results after 28 days of **Akustikduk 80 – 130 g**

| **Compounds** | **Emission rate** ($\mu g/m^2h$) | **Concentration in reference room** (wall area scenario) ($\mu g/m^3$) |
|---|---|---|
| TVOC | < 10 | < 10 |
| ∑ Carcinogenic VOCs | < 1 | < 1 |
| ∑ VOC with LCI | < 2 | < 5 |
| ∑ VOC without LCI | < 2 | < 5 |
| ∑ VVOC | < 2 | < 5 |
| Formaldehyde | n.d. | < 5 |
| ∑ SVOC | < 2 | < 5 |
| $R = \sum C_i / LCI_i$ | < 0.01 | |

## Evaluation of the test results

Byggvarubedömningen has criteria regarding Emissions to indoor environment. The emissions are to measured according to a standard method such as ISO 16000-9. The requirements for the *Recommended class* is that the requirements to one of the following systems are being met: Emicode EC1, Emicode EC1$^{PLUS}$, Blue Angel, M1 (RTS) or GUT. The results of the tested sample is compared to M1.

**Table 3.**
The test reults of **Akustikduk 80 – 130 g** is compared to the relevant requirements in M1

| **Compounds** | **Requirement M1** ($mg/m^2h$) | **Test Results** ($mg/m^2h$) | **Pass / Fail** |
|---|---|---|---|
| TVOC | < 0.2 | **< 0.010** | **PASS** |
| Formaldehyde | < 0.05 | **< 0.005** | **PASS** |
| CMR 1A+1B | < 0.005 | **< 0.001** | **PASS** |
| Ammonia | < 0.03 | not measured | -- |
| Odour | ≥ 0.0 | not measured | -- |

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 Materials - Chemistry**

Performed by

Signed by: Maria Rådemar
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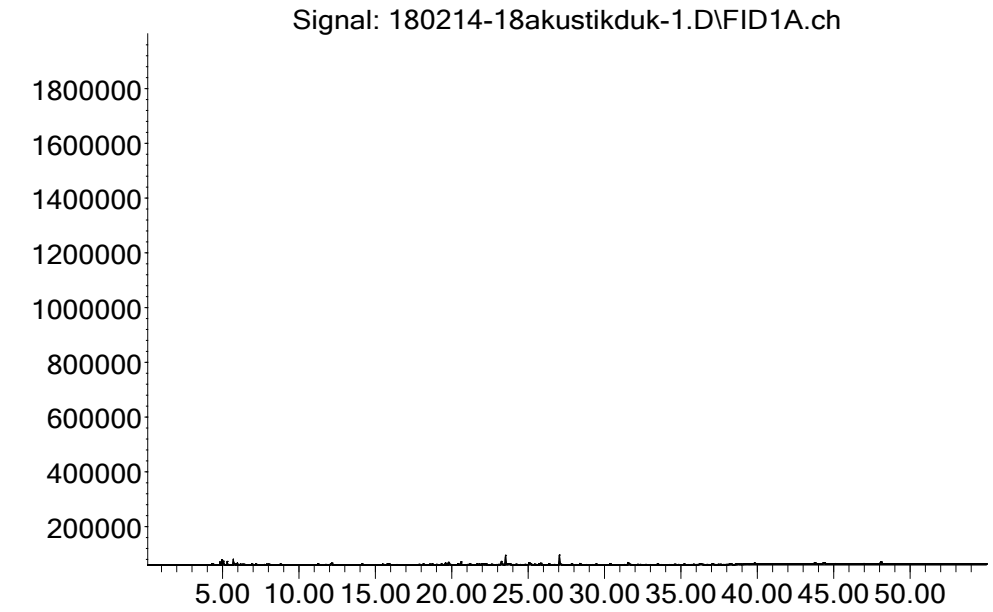
## Appendices

1. Gas Chromatogram
2. Photo of the test specimen
3. Sampling report

Appendix 1

## Gas chromatogram

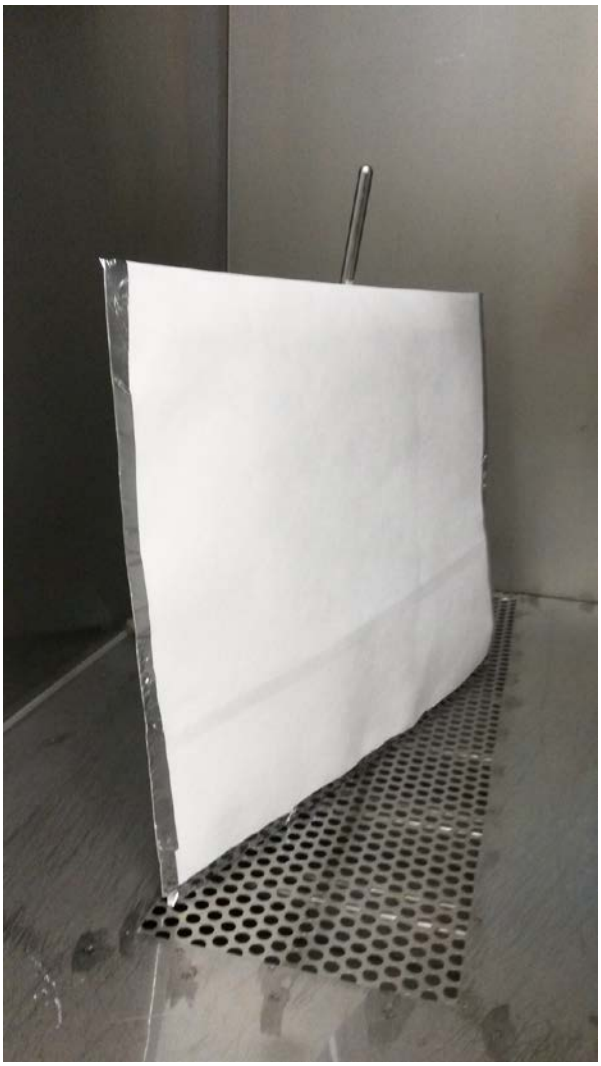
**Akustikduk 80 – 130 g**, after 28 days:
Sampled volume = 5 L




TVOC between $C_6$ and $C_{16}$, means compounds eluting between 6.5 and 38 minutes.

Appendix 2

## Photo of the test specimen



Appendix 3

## Sampling Report

| | |
|---|---|
| **Sampler** (Name, Company, contact info):<br>Daniel Magnusson<br>Akustikmiljö i Falkenberg AB<br>daniel@akustikmiljo.se<br>0706-511146<br>0346-714856 | **Manufacturer of the product** (Company, address): Akustikmiljö i Falkenberg AB<br>Falkäsvägen 4<br>311 32 Falkenberg |
| **Name of product:**<br>1.) Eco Sund med velour<br>2.) Akustikduk 80 – 130g | **Type of product:**<br>1.) Absorbent för väggupphängnad<br>**2.)** Akustikduk |
| **Manufacturing Date:**<br>2018-01-03 | **Batch No:** |
| **Date of sampling:**<br>2018-01-03 | **Amount of material sampled:**<br>1.) 8 st. Eco Sund + velour 600x600x50<br>2.) 3m Akustikduk 3x1,275m<br>**Packing material: Wellpapp kartong** |
| **Sample is taken from:**<br>Production line x<br>Stock / Storage ☐<br>Miscellaneous ☐<br>-where, specify: | **How was the product stored before sampling?**<br>1.) På pall ihop med samma material<br>2.) På 250lpm rulle, inplastat |
| **If a sub-sample was collected from a larger material amount, describe how the sub-sample was taken:** | |
| **Observations and remarks:** | |
| **Confirmation**<br>I hereby confirm that the sample was selected, taken and packed in accordance with the instructions. | |
| **Date:**<br>2018-01-04 | **Signature:** |