

## Emission measurements after 28 days

(2 appendices)

### Test object

A sound absorbing panel.

Product name:	<b>Airfelt</b>
Manufacturer:	NÅ Formtextil
Production date:	2020-10-21
Sampling date:	2020-10-22
Size of sample:	One panel, approx. 110 x 42 cm
Package:	plastic foil, cardboard box
Date of arrival:	2020-10-23

### Assignment

Emission measurements according to SS-EN 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).

The results of the measurements will be used for registration to Byggvarubedömningen.

### Method

The test was started on October 27 by unpacking the sample. A piece of 42 x 25 cm was cut out from the panel. The specimen was placed in a separate conditioning container (with air velocity of approx. 0.2 m/s) in a room with controlled climate conditions of  $23 \pm 3$  °C and  $50 \pm 5$  % RH. The test specimen was placed in the emission chamber four days prior to the air sampling.

Air samplings after 28 days of conditioning were carried out on 2020-11-24.

Conditions of the test in the emission chamber:

Test chamber volume:	0.27 m <sup>3</sup>
Area of test specimen:	0.21 m <sup>2</sup>
Air exchange rate:	0.5 h <sup>-1</sup>
Area specific air change rate:	0.63 m <sup>3</sup> /m <sup>2</sup> h.
Temperature:	$23 \pm 1$ °C
Relative humidity:	$50 \pm 5$ % RH
Air velocity at specimen surface:	0.1 – 0.3 m/s

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Tenax TA was used as adsorption medium for VOC. The tubes were thermally desorbed and analysed in accordance to SP 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 2.7 – 6.2 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<sup>3</sup> and above.

The samplings of aldehydes were carried out with DNPH samplers. The samplers were analysed according to SP 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 33 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). 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<sup>-1</sup>. The wall area is 31.4 m<sup>2</sup>, floor/ceiling area is 12 m<sup>2</sup>, small area, like a door, is 2 m<sup>2</sup> and very small area, like sealant, is 0.2 m<sup>2</sup>. Small 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<sup>3</sup>

E<sub>a</sub> = area specific emission rate, in µg/m<sup>2</sup>h

A = surface area of product in reference room, in m<sup>2</sup>

n = air exchange rate, in changes per hour

V = volume of the reference room, in m<sup>3</sup>

**Table 1.**  
Emission results of the product **Airfelt** after 28 days.

Volatile organic compounds	CAS number	Retention time (min)	ID <sup>1</sup>	Emission rate (µg/m <sup>2</sup> h)	Concentration in reference room (small area) (µg/m <sup>3</sup> )	LCI <sub>i</sub> (µg/m <sup>3</sup> )	R <sub>i</sub> (c <sub>i</sub> /LCI <sub>i</sub> )
<b>TVOC (C<sub>6</sub> – C<sub>16</sub>)</b>	--	6.2 – 38	B	< 10	< 5	--	--
<b>Volatile Carcinogens<sup>2</sup></b>		6.2 – 38					
No substances detected	--	--	B	< 1	< 1	--	--
<b>VOC with LCI<sup>3</sup></b>		6.2 – 38					
No substances detected	64-19-7	6.1	A	< 2	< 5	--	--
<b>Σ VOC with LCI</b>	--	--	A	< 2	< 5	--	--
<b>VOC without LCI<sup>4</sup></b>		6.2 – 38					
No substances detected	--	7.0	B	< 2	< 5	--	--
<b>Σ VOC without LCI</b>	--	--	B	< 2	< 5	--	--
<b>SVOC (C<sub>16</sub> – C<sub>22</sub>)<sup>5</sup></b>		38 – 51.3					
No substances detected	--	--	B	< 2	< 5	--	--
<b>Σ SVOC</b>	--	--	B	< 2	< 5	--	--
<b>VVOC (&lt; C<sub>6</sub>)<sup>6</sup></b>		4.5 – 6.2					
Formaldehyde <sup>7</sup>	50-00-0	--	A	< 1	< 1	100	--
Acetaldehyde <sup>7</sup>	75-07-0	--	A	< 1	< 1	1200	--
<b>Σ VVOC</b>	--	--	A	< 1	< 1	--	--
<b>R = Σ C<sub>i</sub> / LCI<sub>i</sub><sup>8</sup></b>	--	--	--	--	--	--	< 0.01

<sup>1</sup>) ID: A = quantified compound specific, B = quantified as toluene-equivalent

<sup>2</sup>) Volatile carcinogens = VOCs according to EU Regulation No 1272/2008 Annex VI, cat 1A and 1B

<sup>3</sup>) VOC with LCI = identified VOC-compound with LCI-value according to EU-LCI, Dec 2019

<sup>4</sup>) VOC without LCI = VOC-compound without LCI-value or not identified.

<sup>5</sup>) SVOC = semi-volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)

<sup>6</sup>) VVOC = very volatile organic compounds, as defined in ISO 16000-6 (not part of accreditation)

<sup>7</sup>) VVOC-aldehydes measured with DNPH samplers (ISO 16000-3)

<sup>8</sup>) All VVOC, VOC, SVOC and carcinogens with LCI

## COMMENT:

Only VOC-compounds with an emission rate higher than 2 µg/m<sup>2</sup>h are listed in Table 1, carcinogenic compounds ≥ 1 µg/m<sup>2</sup>h. Only compounds with a concentration in the reference room ≥ 5 µg/m<sup>3</sup> are evaluated based on LCI (= lowest concentration of interest).

TVOC expressed in µg/m<sup>3</sup> is the sum of all individual substances with concentrations ≥ 5 µg/m<sup>3</sup> (in toluene equivalents) in the reference room. The emission rate of TVOC (µg/m<sup>2</sup>h) includes all compounds of approx. ≥ 1 µg/m<sup>2</sup>h in the emission chamber.

Quantification limit for TVOC is 10 µg/m<sup>2</sup>h. Measurement uncertainty for TVOC is 15 % (rel) and for formaldehyde 30 % (rel). Background of TVOC in the empty chamber was below 10 µg/m<sup>3</sup> and is subtracted.

See Appendix 1 for gas chromatograms (FID spectra)

## Summary of the test results

The test results are summarized in Table 2.

**Table 2.**

Summary of the emission results after 28 days of the product **Airfelt**

Compounds	Emission rate (µg/m <sup>2</sup> h)	Concentration in reference room (small area scenario) (µg/m <sup>3</sup> )
TVOC	< 10	< 5
∑ Carcinogenic VOCs	< 1	< 1
∑ VOC with LCI	< 2	< 5
∑ VOC without LCI	< 2	< 5
∑ VVOC	< 2	< 5
Formaldehyde	< 1	< 1
∑ SVOC	< 2	< 5
$R = \sum C_i / LCI_i$	< 0.01	

## Evaluation of the test results

Byggarubedömningen has criteria regarding Emissions to indoor environment. The emissions are to be 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: Emission class EC1, Emission class EC1<sup>PLUS</sup>, Blue Angel, M1 (RTS) or GUT.

The results of the tested sample are compared to M1.

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 3.**

The test results of the product **Airfelt** are compared to the relevant requirements in M1

<b>Compounds</b>	<b>Requirement M1 (small area) (mg/m<sup>3</sup>)</b>	<b>Test Results (mg/m<sup>3</sup>)</b>	<b>Pass / Fail</b>
TVOC	< 0.02	< <b>0.005</b>	<b>PASS</b>
Formaldehyde	< 0.01	< <b>0.001</b>	<b>PASS</b>
CMR 1A+1B	< 0.001	< <b>0.001</b>	<b>PASS</b>
Single VOC (µg/m <sup>3</sup> )	≤ EU-LCI	< <b>EU-LCI</b>	<b>PASS</b>
Ammonia	< 0.01	not measured	--
Odour	≥ 0.0	not measured	--

## Conclusion

The test results complies with the tested requirements of M1 and meet the requirements of Byggvarubedömningen for the *Recommended class*.

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## Appendices

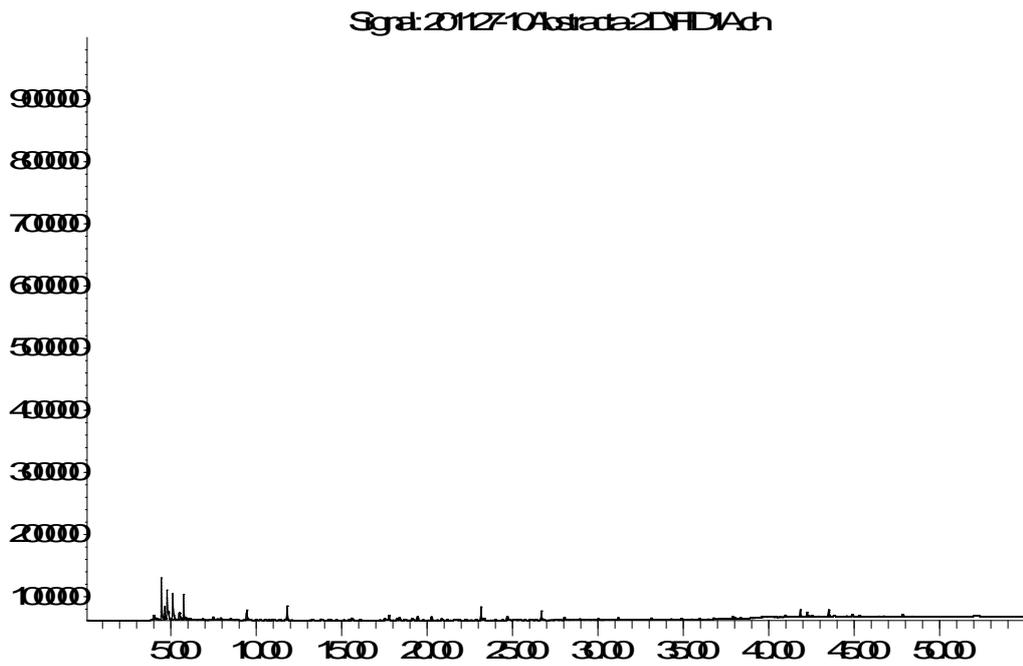
1. Gas chromatogram
2. Photo of test specimen

Appendix 1

**Gas chromatogram**

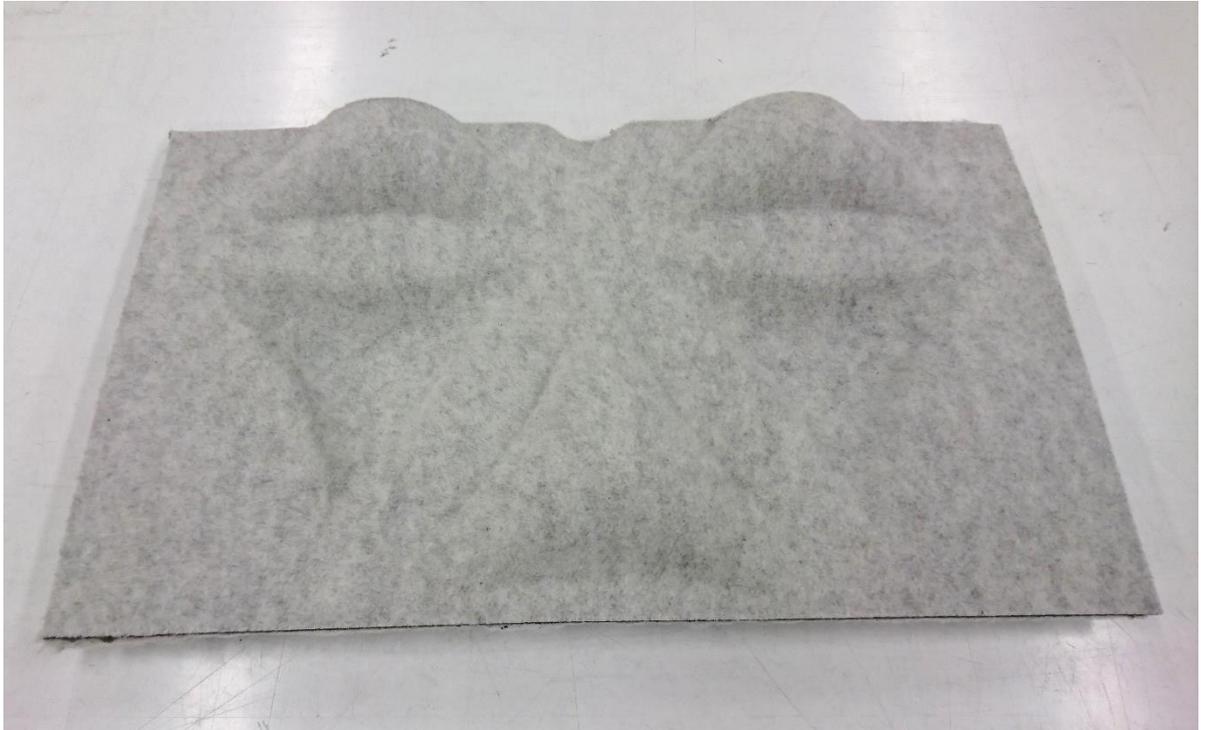
**Airfelt** after 28 days

**Abundance**



TVOC between C<sub>6</sub> and C<sub>16</sub>, means compounds eluting between 6.9 and 38.8 minutes.

## Appendix 2

**Photo of test specimen****Airfelt**