

Götessons Industri AB  
Stellan Bygård  
Rönnåsgatan 5 A  
523 38 ULRICEHAMN

## Emission Measurements of an Acoustic Screen

(2 appendices)

### Object

One sample of an acoustic screen was delivered to RISE.

Sample marking:	<b>Screen IT A30</b> 650 x 800 x 40 mm Production date: week 29, 2018
Packaging:	packed in card board
Date of arrival:	2018-07-26
Date of analysis:	week 30 – 32, 2018

### Assignment

Emission measurements according to **ANSI/BIFMA M7.1-2011(R2016)** (Standard Test Method for Determining VOC Emissions from Office Furniture Systems, Components, and Seating), with air samples taken from the test chamber at the 72<sup>nd</sup> and 168<sup>th</sup> hour regarding volatile organic compounds (VOC), formaldehyde and aldehydes.

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

### Method

Prior the emission testing, the test specimen was stored in the original shipping container in a room with controlled climate conditions of  $23 \pm 2$  °C and  $50 \pm 10$  % RH.  
The test specimen was unpacked and placed in the test chamber 2018-07-27.

Test conditions in the chamber:

Chamber volume:	1.0 m <sup>3</sup>
Temperature:	$23 \pm 0.5$ °C
Relative humidity:	$50 \pm 3$ % RH
Air change rate:	1.0 h <sup>-1</sup>
Area (simplified):	1.0 m <sup>2</sup>
Loading:	1.0 m <sup>2</sup> /m <sup>3</sup>
Air samplings day 3:	2018-07-30
Air samplings day 7:	2018-08-03

### RISE Research Institutes of Sweden AB

Postal address	Office location	Phone / Fax / E-mail
Box 857 SE-501 15 BORÅS Sweden	Brinellgatan 4 SE-504 62 BORÅS	+46 10 516 50 00 +46 33 13 55 02 info@ri.se

This report may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

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.

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 formaldehyde, acetaldehyde and propanal were carried out with DNPH samplers. The samplers were analysed according to RISE method 2302, similar to ISO 16000-3:2001 -Indoor air--Part 3: Determination of formaldehyde and other carbonyl compounds – Active sampling method. This means analysis on a liquid chromatograph with absorbance detector. The other aldehydes (Butanal, Pentanal, Hexanal, Heptanal, Octanal, Nonanal and Benzaldehyde) were analyzed by GC-MS/FID by sampling on Tenax TA. Duplicate air samples were taken and the results are mean values.

## Results

The results of the emission tests are summarized on the following pages in accordance with the BIFMA M7.1-2011(R2016) guidelines for reporting.

**Table 1.**  
**Concentrations of Formaldehyde, Acetaldehyde and Total Aldehydes (µg/m<sup>3</sup>)**

Volatile organic compound	72 <sup>nd</sup> hour				168 <sup>th</sup> hour			
	# 1	# 2	Mean	% diff	# 1	# 2	Mean	% diff
<b>Formaldehyde</b>	< 2	< 2	< 2	1	< 2	< 2	< 2	1
<b>Acetaldehyde</b>	3	3	<b>3</b>	7	2	2	<b>2</b>	5
<b>Total Aldehydes</b>	28	27	<b>27</b>	4	24	24	<b>24</b>	1

Sampling cartridges: silica gel coated with DNPH. Sampling volumes: 50 –80 L. Total aldehydes are defined as the sum of all normal-between n-C<sub>1</sub> and n-C<sub>9</sub>-aldehydes plus benzaldehyde.

**Table 2.**  
Concentrations of VOCs between n-C<sub>6</sub> and n-C<sub>16</sub> measured by GC-MS/FID (µg/m<sup>3</sup>)

Volatile organic compound	CAS	RT (min)	ID	72 <sup>nd</sup> hour				168 <sup>th</sup> hour			
				# 1	# 2	Mean	% diff	# 1	# 2	Mean	% diff
<b>Alcohols</b>											
1-Butanol	71-36-3	7.6	A	2	3	<b>3</b>	40	3	3	<b>3</b>	23
<b>Terpenes</b>											
α-Pinene	80-56-8	17.6	A	110	130	<b>120</b>	15	100	120	<b>110</b>	20
Camphene	79-92-5	18.4	B	2	2	<b>2</b>	15	2	2	<b>2</b>	50
β-Myrcene	123-35-3	19.2	B	5	5	<b>5</b>	2	5	5	<b>5</b>	2
β -Pinene	127-91-3	19.4	A	3	3	<b>3</b>	1	3	3	<b>3</b>	2
3-Carene	13466-78-9	20.4	A	130	120	<b>130</b>	1	120	120	<b>120</b>	1
p-Cymene	99-87-6	20.9	B	2	2	<b>2</b>	5	2	2	<b>2</b>	1
Limonene	138-86-3	21.1	A	5	6	<b>6</b>	10	5	4	<b>4</b>	18
Terpinolene	586-62-9	23.1	B	7	8	<b>8</b>	6	8	7	<b>7</b>	4
<b>Glycols / Glycol Ethers</b>											
1-Pentanol	71-41-0	10.7	A	9	9	<b>9</b>	2	8	8	<b>8</b>	5
<b>Aldehydes</b>											
Pentanal	110-62-3	8.7	A	7	6	<b>7</b>	6	6	6	<b>6</b>	3
Hexanal	66-25-1	12.1	A	17	17	<b>17</b>	3	15	15	<b>15</b>	1
<b>Acids</b>											
Hexanoic acid	142-62-1	17.8	A	6	5	<b>6</b>	27	5	7	<b>6</b>	27
<b>Others</b>											
Unkown (possibly: Decanoic acid, decyl ester), SVOC	--	39.8	B	7	8	<b>8</b>	10	8	8	<b>8</b>	1
<b>TVOC</b>	--	6.5-38	B	290	280	<b>290</b>	4	240	270	<b>250</b>	9

Sorbent tube and media: Stainless steel tube with Tenax-TA; Sampling volumes: 3 – 10 L

ID: A = quantified compound specific, B = quantified in toluene equivalents

<sup>1)</sup> 1,3-dichloro-2-Propanol is a carcinogenic compound according to EU Regulation No 1272/2008 Annex VI, cat 1B

The background of TVOC in the empty chamber was < 10 µg/m<sup>3</sup>. The background of formaldehyde in the empty chamber was < 1 µg/m<sup>3</sup>. The background values are subtracted. Measurement uncertainty: TVOC 15 % (rel), formaldehyde and acetaldehyde 30 % (rel).

The results in Table 3 are expressed as area specific emission rates. The area of the product is 1.0 m<sup>2</sup> (both sides). The calculated area is a simplified area according to ANSI/BIFMA M7.1-2011(R2016). The emission factors are calculated by:

$$SER_A = \frac{Conc \times n}{L}$$

$SER_A$  = area specific emission rate, in  $\mu\text{g}/\text{m}^2\text{h}$   
 Conc = concentration of a VOC in the chamber, in  $\mu\text{g}/\text{m}^3$   
 n = air exchange rate in the chamber, in changes per hour  
 L = loading factor, in  $\text{m}^2/\text{m}^3$  (area of sample/volume of chamber)

**Table 3.**  
**Calculated Emission Factors for TVOC, Formaldehyd, Acetaldehyde, Total Aldehydes and identified VOCs ( $\mu\text{g}/\text{m}^2\text{h}$ )**

Volatile organic compound	Emission factor	
	72 <sup>nd</sup> hour (3 days)	168 <sup>th</sup> hour (7 days)
TVOC <sub>Toluene</sub>	290	250
Formaldehyde	< 2	< 1
Acetaldehyde	3	2
Total Aldehydes ( $\mu\text{mol}/\text{m}^2\text{h}$ )	0.34	0.31
4-Phenylcyclohexene	< 1	< 1
Individual VOC:		
1-Butanol	3	3
$\alpha$ -Pinene	120	110
Camphene	2	2
$\beta$ -Myrcene	5	5
$\beta$ -Pinene	3	3
3-Carene	130	120
p-Cymene	2	2
Limonene	6	4
Terpinolene	8	7
1-Pentanol	9	8
Pentanal	7	6
Hexanal	17	15
Hexanoic acid	6	6
Unkown (possibly: Decanoic acid, decyl ester), SVOC	8	8

See Appendix 1 for gas chromatograms (FID spectra) and Appendix 2 for a photo of the tested product.

## Evaluation of the test results

The data obtained from emission testing of the product is compared to the ANSI/BIFMA X7.1-2011(R2016) (Standard for Formaldehyde & TVOC Emissions of Low-emitting Office Furniture and Seating). These criteria must be met at the seven-day time point specified in the ANSI/BIFMA M7.1-2011(R2016), se Table 4.

**Table 4.****Comparison of Emission Factors for the Screen IT A30 and Maximum Emission Factors (ANSI/BIFMA X7.1-2011(R2016))**

<b>Volatile organic compound</b>	<b>Maximum Emission Factors Open Plan Office Environment</b>	<b>Emission Factors for the tested product</b>	<b>Pass / Fail</b>
Formaldehyde ( $\mu\text{g}/\text{m}^2\text{h}$ )	42.3	< 1	<b>PASS</b>
TVOC ( $\mu\text{g}/\text{m}^2\text{h}$ )	345	250	<b>PASS</b>
Total Aldehydes ( $\mu\text{mol}/\text{m}^2\text{h}$ )	2.8	0.31	<b>PASS</b>
4-Phenylcyclohexene ( $\mu\text{g}/\text{m}^2\text{h}$ )	4.5	< 1	<b>PASS</b>

## Summary of the results

The emission factors for the tested product are in compliance with all the maximum emission factors of ANSI/BIFMA X7.1-2011(R2016)..

### **RISE Research Institutes of Sweden AB Chemistry and Materials - Chemistry**

Performed by

Examined by

Maria Rådemar

Tove Malin

### Appendices

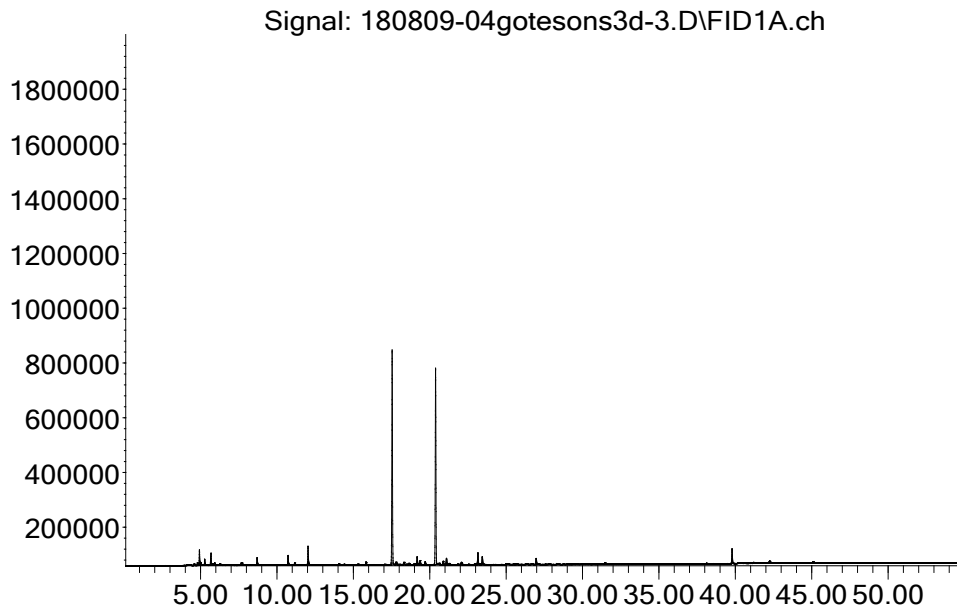
1. Gas Chromatograms
2. Photo of the test specimen

Appendix 1

**Gas chromatograms**

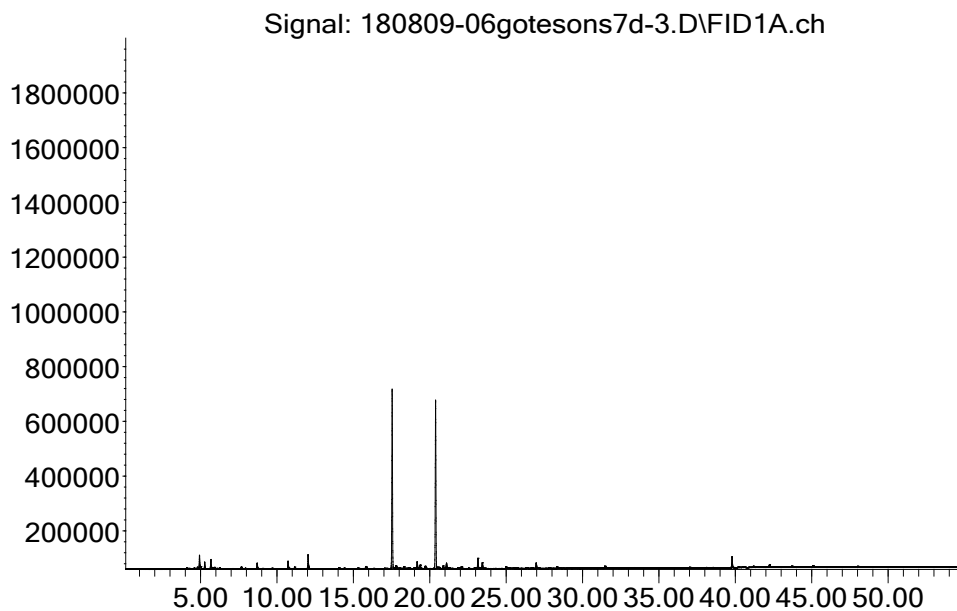
**Screen IT A30, after 3 days:**

Abundance



**Screen IT A30, after 7 days:**

Abundance



TVOC between C<sub>6</sub> and C<sub>16</sub>, means compounds eluting between 6.5 and 38 minutes.

## Appendix 2

**Photo of the test specimen**