

SOUND ABSORPTION FOR OFFECCT MOBILE SCREEN THELMA

CONCLUSIONS

The sound absorption area for mobile screen Thelma has been measured for OFFECCT according to the reverberation room method SS-EN ISO 354:2003 and evaluated according to SS 25269:2013/ISO 20189:2018. The measurement result for sound absorption area is presented in a separate protocol 21-758-M1.

The result as N_{10} -value as defined by *Kammarkollegiet* is presented in the table below.

Tested object	N_{10}
Thelma	4.8

1. CLIENT

OFFECCT AB, Grönhultsvägen 3B, 543 51 Tibro, Sweden
 Contact: Tobias Strålman, +46 (0)766 12 14 96, tobias.stralman@flokk.com

2. ASSIGNMENT

To measure the sound absorption for a screen for OFFECCT according to SS-EN ISO 354:2003 and evaluate according to SS 25269:2013 and ISO 20189:2018.

Akustikverkstan is accredited for all these standards.

3. TEST OBJECT

Thelma is a mobile floor standing screen made of a tubular steel frame with wheels and two partly overlapping sound absorbing sheets made of recycled textiles and PET-bottles covered with fabric.

Dimensions of the screen including the frame are given in table 1.

Test object name from client	Thickness (mm)	Width (mm)	Height (mm)	Measurement protocol
Thelma	50-70	1100	1720	M1

Table 1: Tested object with dimensions.

The sound absorbing sheets covers an area with measurements 1460 x 1075 mm. Photo of the test setup with two screens is shown in figure 1.

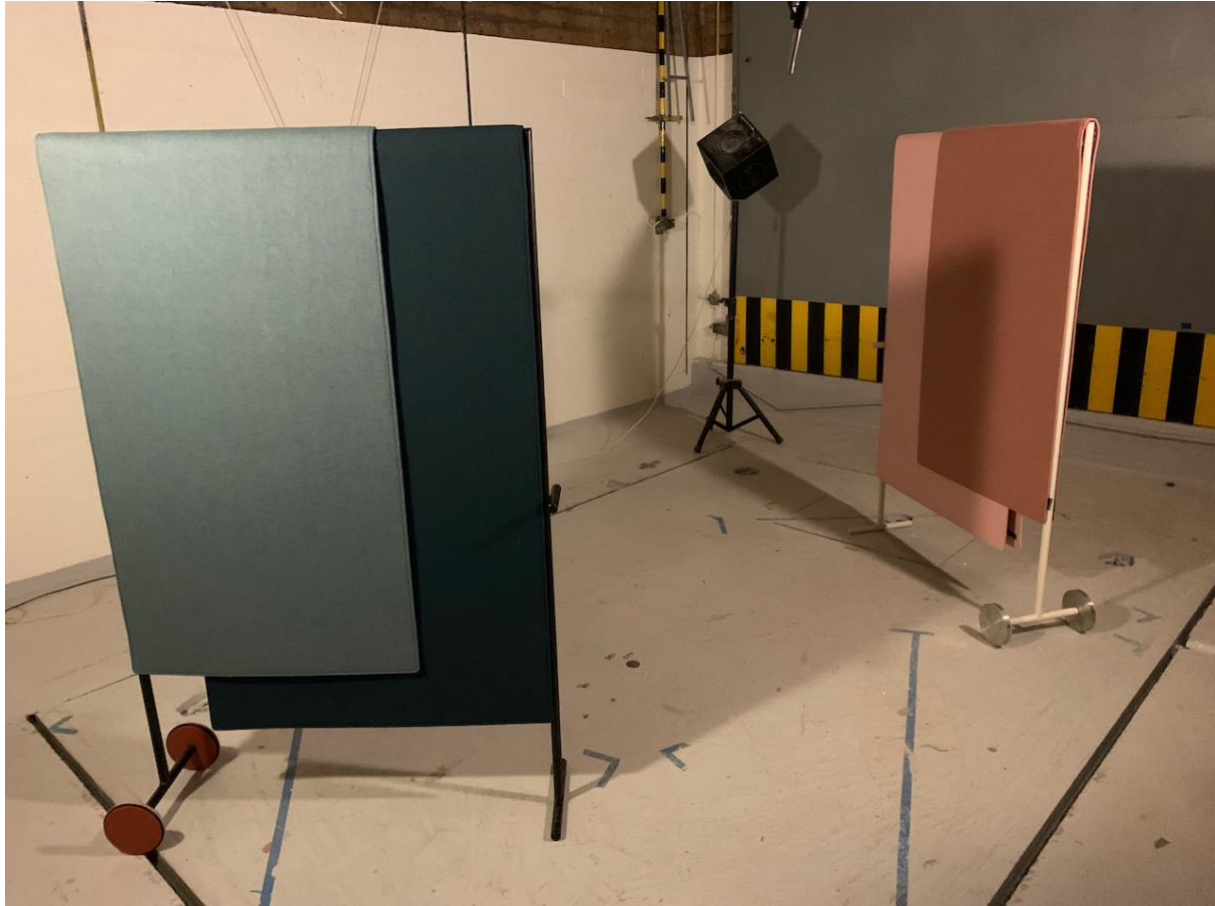


Figure 1. Photo of test set-up for Thelma. One of three positions.

4. MEASUREMENT PROCEDURE

The absorption measurements were performed according to the standard SS-EN ISO 354:2003. The two screens were tested in three positions as shown in appendix 3.

The measurements were made with three speaker positions and four microphone positions. The results for sound absorption area were evaluated according to SS 25269:2013/ISO 20189:2018. The test specimen area fulfils the requirements in SS-EN ISO 354:2003.

The measurements were performed by Joachim Schubert 2021-12-17 in Akustikverkstan's reverberation room in Skultorp, Skövde, Sweden. More information on the test facilities can be found in Appendix 2.

5. MEASUREMENT EQUIPMENT

Table 2 lists the equipment used during the measurements. The equipment fulfils class 1 according to SS-EN 61672-1, 60942 and 61260. Date for the latest calibration is available in the instrument journal of Akustikverkstan.

Instrument	Manufacture and type	Serial number	Internal designation
Measurement computer	HP Zbook		DA02
Front end	National Instruments NI 9234	1918620/190DB0B	AN05
Microphone	Roga MI-17	592	MI04
Microphone	Roga MI-17	593	MI05
Microphone	Roga MI-17	594	MI06
Microphone	Roga MI-17	595	MI07
Speaker	IMA Kub 1	8	HÖ7
Speaker	IMA Kub 1	9	HÖ8
Speaker	IMA Kub 1	10	HÖ9
Equalizer	Monacor MEQ-2152	-	Lab
Amplifier	Denon POA-2200	-	Lab

Table 2: Equipment used during the measurements.

6. MEASUREMENT RESULTS

Detailed measurement results for all test objects are available in the measurement protocol 21-758-M1 attached as appendix to this report. The results are only valid for the tested samples.

7. COMMENTS AND INTERPRETATIONS

N_{10} -value

Kammarkollegiet, the Swedish authority dealing with public purchasing, has published advice regarding purchasing of sound absorbers. They define the value N_{10} according to the formula:

$$N_{10} = \frac{10}{A_{500}}$$

A_{500} is the sound absorption area at the 500 Hz octave band for the sound absorber. The N_{10} value is developed to be a single value metric for speech sound absorption and describes how many objects are needed to obtain 10 m² of sound absorption area in the 500 Hz octave band. If the sound absorption is lower in any octave above 500 Hz, the lower value will be used instead. The N_{10} -value of the test object can be seen in table 3.

Measurement protocol	Test object	N_{10}
M1	Thelma	4.8

Table 3: N_{10} -value based on sound absorption area measurement of the product.

8. MEASUREMENT UNCERTAINTY

The uncertainties in measured sound absorption coefficients have been estimated to the values in table 4. The uncertainty corresponds to one standard deviation. The uncertainties for the sound absorption area measurements are concluded from the same values multiplied with the test specimen area.

50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz
± 0.10	± 0.08	± 0.07	± 0.06	± 0.05	± 0.04	± 0.03
250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz
± 0.03	± 0.03	± 0.03	± 0.03	± 0.03	± 0.03	± 0.03
1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz
± 0.03	± 0.03	± 0.03	± 0.03	± 0.03	± 0.03	± 0.03

Table 4: Measurement uncertainty for each third octave.

9. DEVIATIONS FROM THE STANDARD

The total measured sound absorption area at lower frequencies is below 1 m². According to ISO 20189:2018, the total sound absorption should exceed 1 m² in each frequency band.

This report should always be used in its complete context, even though the measurement protocols may be used independently.

Joachim Schubert

Reviewed by Johan Jernstedt, 2022-01-03

APPENDIX 1: MEASURED REVERBERATION TIMES

frequency (Hz)	Empty	Thelma, position 1	Thelma, position 2	Thelma, position 3
50	7.75	6.30	6.69	6.47
63	8.29	6.86	7.23	7.10
80	7.78	7.14	6.90	7.05
100	7.25	6.82	6.45	6.20
125	6.70	5.51	4.98	5.09
160	5.26	4.39	4.12	4.32
200	5.35	3.96	3.90	4.29
250	5.32	3.90	3.88	3.92
315	5.45	3.47	3.61	3.56
400	5.24	3.36	3.25	3.26
500	4.72	2.95	2.77	2.90
630	4.20	2.57	2.63	2.56
800	4.73	2.64	2.65	2.68
1000	4.55	2.59	2.59	2.63
1250	4.04	2.38	2.41	2.43
1600	3.53	2.23	2.19	2.21
2000	3.11	2.04	2.01	2.02
2500	2.74	1.83	1.85	1.84
3150	2.26	1.59	1.56	1.60
4000	1.83	1.38	1.37	1.38
5000	1.50	1.17	1.16	1.16

No of objects	0	2	2	2
T (°C)	19	20	20	20
RH (%)	37	35	36	36

APPENDIX 2: INFORMATION ABOUT THE REVERBERATION ROOM

The reverberation room is rectangular, measuring Length x Width x Height = 5.85 x 4.65 x 7.35 m. The room volume is 200 m³ and the total area of the walls, ceiling and floor is 209 m². There are 22 diffusors (size 0.775 x 1.25 m) randomly installed in the room. The reverberation time between 50 and 200 Hz is controlled with membrane absorbers on the walls.

The test specimen is put on the floor on the mounting area (10 m², 2.6 x 3.85 m) according to figure A2.1. The mounting area consists of a concrete slab that can be lowered up to 700 mm below the floor.

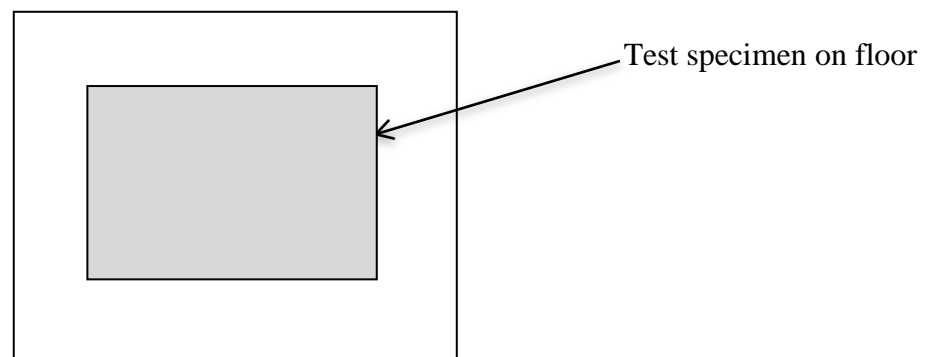


Figure A2.1: Plane drawing of the reverberation room with the position of the mounting area.

APPENDIX 3: PHOTOS OF SCREENS IN THREE POSITIONS



Figure A3.1: Position 1



Figure A3.2: Position 2

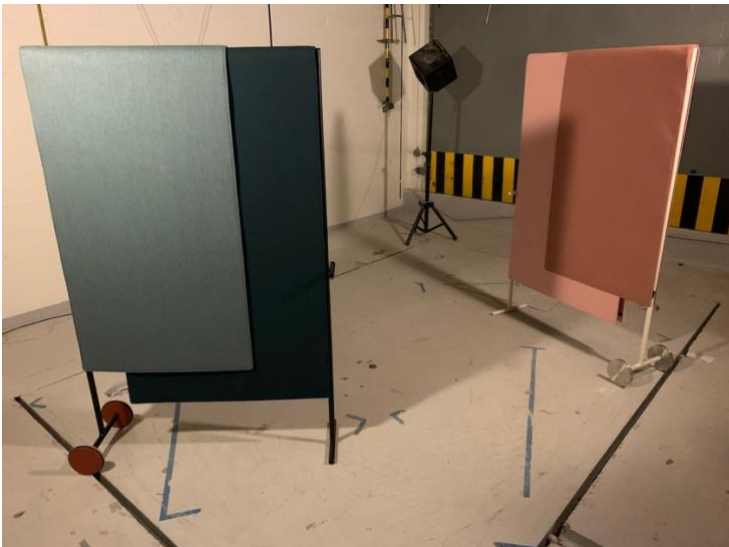


Figure A3.3: Position 3

Thelma

SOUND ABSORPTION AREA ACCORDING TO SS-EN ISO 354:2003, SS 25269:2013 and ISO 20189:2018

Measurement of sound absorption area in a reverberation room



Report number:
21-758-M1
Date
2021-12-27

Akkred. nr. 10445
Provning
ISO/IEC 17025

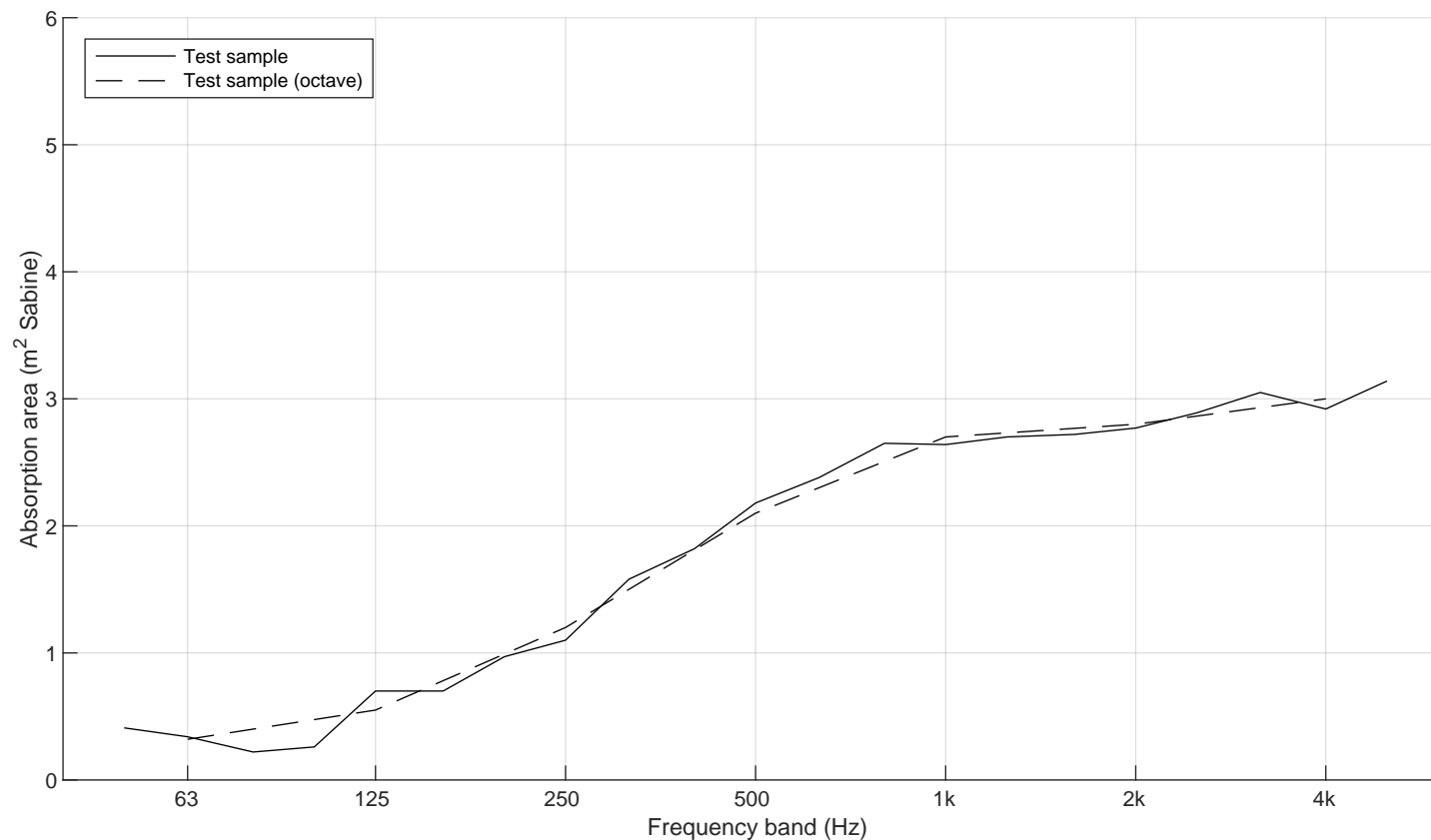
Frequency f [Hz]	Sound absorption area per object [m ² Sabine]	
50	0.41	
63	0.34	0.32
80	0.22	
100	0.26	
125	0.70	0.55
160	0.70	
200	0.97	
250	1.10	1.2
315	1.58	
400	1.82	
500	2.18	2.1
630	2.38	
800	2.65	
1000	2.64	2.7
1250	2.70	
1600	2.72	
2000	2.77	2.8
2500	2.89	
3150	3.05	
4000	2.92	3.0
5000	3.14	

Client: OFFECCT
Manufacturer: OFFECCT
Product identification: Thelma

Description of test specimen: Mobile floor standing screen made of a tubular frame of steel covered with two partly overlapping sheets made of recycled textile and PET bottles. Thickness: 50-70 mm, height 1720 mm and width 1100 mm.
Average of results from tests in three positions.

Reverberation room volume: 200 m³
Temperature: 20.0 °C (empty: 19.0 °C)
Air humidity: 36 % (empty: 37 %)
Air pressure: 100.8 kPa (empty: 100.9 kPa)
Number of objects: 2

Measurement date: 2021-12-17
Measured by: Joachim Schubert



$$N_{10} = 4.8$$