TEST REPORT

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AKUART
LABORATORY MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

Project name: Akuart – laboratory measurements
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Summary

On October 23rd 2019 Sweco - Acoustica has performed reverberation chamber measurements of the sound absorption coefficient of various acoustic wall panels from Akuart. The report documents test results of three different types of acoustic walls panels plus one type of insulation batts.

The following has been measured:

Measurement of equivalent sound absorption area in compliance with DS/EN ISO 354:2003.

No.	Test object	Area of test object	Sound absorption coefficient							
		[m^2]	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	α_w	Abs. class
A1	Akuart Home 30, Canvas type Portland. 30 mm frame. Core material: 20 mm polyester	11,2	0,15	0,40	0,80	1,00	1,00	1,00	0,70	C(MH)
A2	Akuart Home 50, Canvas type Portland. 50 mm frame. Core material: 40 mm polyester	11,2	0,35	0,80	1,00	1,00	1,00	1,00	1,00	A
A3	Akuart SmartArt 60. 60 mm frame. Core material: 40 mm polyester 3.820 g/m^2	11,5	0,20	0,65	1,00	1,00	1,00	1,00	0,95	A
A4	Core material: 40 mm eelgrass insulation batts: 4.000 g/m^2	10,7	0,15	0,55	1,00	1,00	1,00	1,00	0,85	B(MH)

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Appendix

1. Introduction

Sweco - Acoustica has been commissioned by Akuart A/S to perform reverberation chamber measurements of the sound absorption coefficient of various acoustic wall panels.

2. Test objects

The measurement objects are three different Akuart acoustic wall panels and one insulation batt, intended to be used as sound absorbing core material.

The test objects were placed directly on the floor of the reverberation chamber.

The tested products are:

A1. Akuart Home 30. Canvas type Portland, mounted in 30 mm aluminium frame. The core material is 20 mm polyester panels, mounted in the frame with 10 mm airspace behind the panels.
Total test area: 11,2 m^2.

A2. Akuart Home 50. Canvas type Portland, mounted in 50 mm aluminium frame. The core material is 40 mm polyester panels, mounted in the frame with 10 mm airspace behind the panels.
Total test area: 11,2 m^2.

A3. Akuart SmartArt 60, mounted in 60 mm frame. The core material is 40 mm polyester panels (3.820 g/m^2), mounted in the frame with 10 mm airspace behind the panels.
Total test area: 11,5 m^2.

A4. 40 mm eelgrass insulation batts (4.000 g/m^2).
Total test area: 10,7 m^2.

3. Procedure

3.1. Methods used

The measurements were performed according to DS/EN ISO 354:2003, using the interrupted noise method and a broadband pink noise signal with 1/3-octave band filters. Two speaker positions and six microphone positions were used. In each microphone position the reverberation time was measured as an average of four measurements.

3.2. Deviations from, additions to, and exclusions from test method

In measurement A3, the specimen length-width ratio was 0,5 and thus does not fulfil term 6.2.1.2 in ISO 354:2003 (length-width ratio of 0,7-1,0). This was however the only way of fitting the test specimens in the reverberation chamber, fulfilling the required specimen area, which was judged to be of the highest importance.

It is evaluated to be of no significance to the measurements.

3.3. Rating of sound absorption class

The practical sound absorption coefficient and the sound absorption class are deter-mined according to DS/EN ISO 11654:1997 and are distributed on the following classes:

Sound absorption class	α_w
A	0,90; 0,95; 1,00
B	0,80; 0,85
C	0,60; 0,65; 0,70; 0,75
D	0,30; 0,35; 0,40; 0,45; 0,50; 0,55
E	0,25; 0,20; 0,15
Not classified	0,10; 0,05; 0,00

If the practical sound absorption coefficient exceeds the reference curve in one or more frequency bands by more than 0,25, one or more shape indicators are added:

Shape indicator	The sound absorption coefficient is 0,25 greater than the reference curve in the octave band:
(L)	250 Hz
(M)	500 Hz and/or 1000 Hz
(H)	2000 Hz and/or 4000 Hz

3.4. Reverberation chamber information

The reverberation chamber used for the measurements is located at Techninal University of Denmark, DTU Elektro, Ørsted Plads, building 355, Room 005, DK - 2800 Kgs. Lyngby.

The chamber is fitted with several sound diffusing screens on the walls. Furthermore, during the measurements, the chamber was equipped with transparent freely suspended sound diffusors.

According to DTU, the volume of the room is approx. 240 m^3.

3.5. Equipment

The used measuring equipment is shown in appendix E.

3.6. Temperature and humidity

During the measurements, the temperature varied from 17,5-17,9°C and the humidity was varying from 60-65%. Temperature and humidity for each measurement is shown in appendix A-D.

4. Results

The measured reverberation times (in seconds) are shown in the table below.

Measurement no.	A0	A1	A2	A3	A4
Frequency [Hz]	Empty room	Akuart Home 30 Portland canvas 20 mm polyester 30 mm frames	Akuart Home 50 Portland canvas 40 mm polyester 50 mm frames	Akuart SA 60 Canvas 40 mm polyester 60 mm frames	Insulation batts 40 mm eelgrass No canvas No frames
100	9,6	7,7	5,7	6,7	7,2
125	8,4	6,7	5,2	5,9	6,5
160	8,9	5,6	3,7	4,7	5,4
200	7,5	4,8	3,0	3,6	4,1
250	6,7	3,8	2,9	3,1	3,5
315	6,9	3,4	2,4	2,6	2,9
400	6,8	2,8	2,3	2,2	2,6
500	6,3	2,5	2,2	2,1	2,3
630	6,4	2,5	2,2	1,9	2,1
800	5,8	2,2	2,0	1,9	2,0
1000	5,3	2,0	1,9	1,8	2,0
1250	5,1	1,9	1,9	1,8	2,0
1600	4,7	1,9	1,9	1,7	1,8
2000	4,3	1,8	1,8	1,7	1,8
2500	3,6	1,7	1,8	1,6	1,7
3150	3,0	1,5	1,6	1,4	1,5
4000	2,6	1,5	1,4	1,3	1,4
5000	2,0	1,3	1,3	1,2	1,2

The absorption coefficient is calculated, based on the measured reverberation times, according to DS/EN ISO354:2003.

The calculated absorption coefficients are shown in the table on page 2.

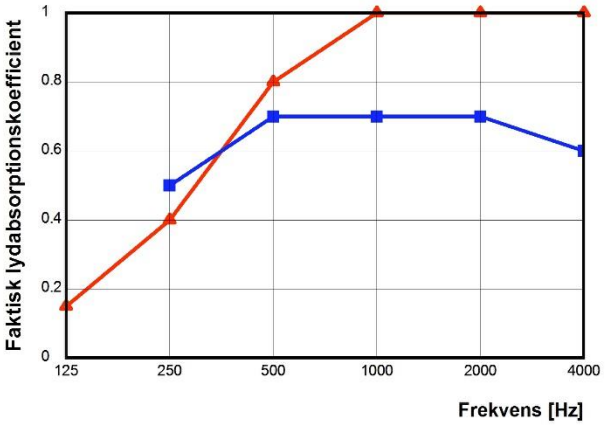
APPENDIX A – MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

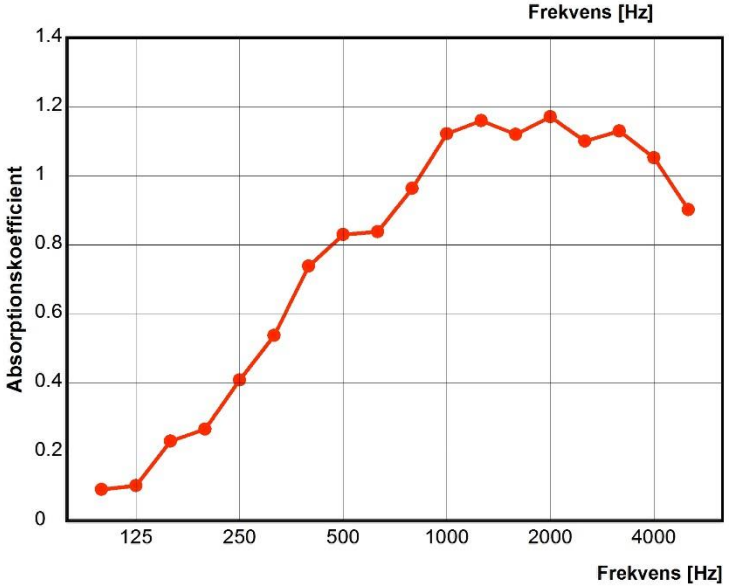
Client:	Akuart A/S	**Measurement no:**	A1
	Skudehavnsvej 1	**Measurement date:**	23-10-2019
	2150 Nordhavn	**Performed by:**	SERA

Test object:

Akuart Home 30, Canvas type Portland
6 panels of 0,84×1,18 m plus 8 panels of 0,68×0,97 m, mounted in 30 mm aluminium frames with 20 mm polyester panels and 10 mm airspace behind the panels.
The test object was placed directly on the floor.

Frekv. [Hz]	Absorptionskoefficient		
	1/3-okt.	1/1-okt.	Ref.-kurve
100	0,09	0,15	
125	0,10		
160	0,23		
200	0,27	0,40	0,50
250	0,41		
315	0,54		
400	0,74	0,80	0,70
500	0,83		
630	0,84		
800	0,96	1,00	0,70
1000	1,12		
1250	1,16		
1600	1,12	1,00	0,70
2000	1,17		
2500	1,10		
3150	1,13	1,00	0,60
4000	1,05		
5000	0,90		





α_w = 0,70
Sound absorption class C(MH)

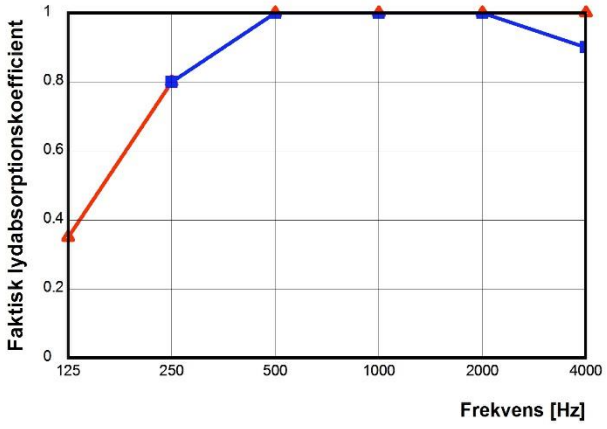
APPENDIX B – MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

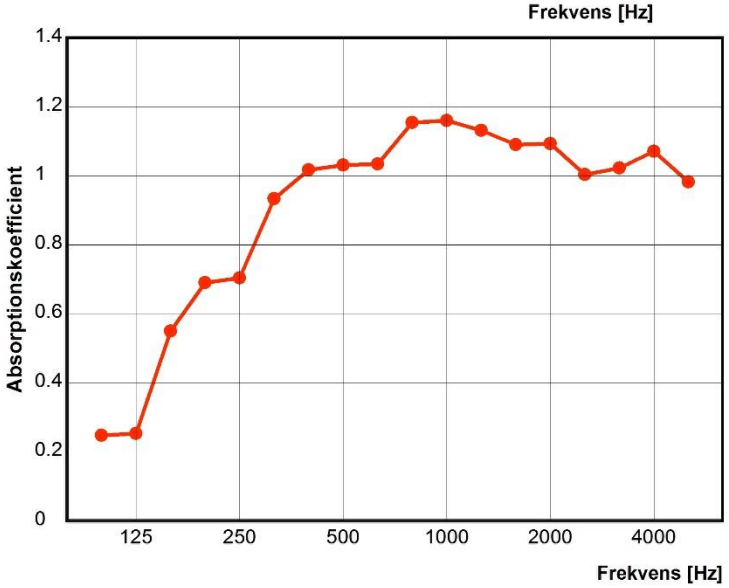
Client:	Akuart A/S	**Measurement no:**	A2
	Skudehavnsvej 1	**Measurement date:**	23-10-2019
	2150 Nordhavn	**Performed by:**	SERA

Test object:

Akuart Home 50, Canvas type Portland
6 panels of 0,84×1,18 m plus 8 panels of 0,68×0,97 m, mounted in 50 mm aluminium frames with 40 mm polyester panels and 10 mm airspace behind the panels.
The test object was placed directly on the floor.

Frekv. [Hz]	Absorptionskoefficient		
	1/3-okt.	1/1-okt.	Ref.-kurve
100	0,25	0,35	
125	0,25		
160	0,55		
200	0,69	0,80	0,80
250	0,70		
315	0,93		
400	1,02	1,00	1,00
500	1,03		
630	1,03		
800	1,15	1,00	1,00
1000	1,16		
1250	1,13		
1600	1,09	1,00	1,00
2000	1,09		
2500	1,00		
3150	1,02	1,00	0,90
4000	1,07		
5000	0,98		





α_w = 1,00
Sound absorption class A

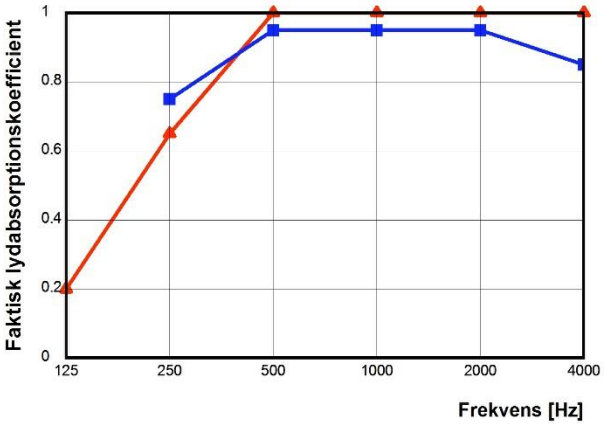
APPENDIX C – MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

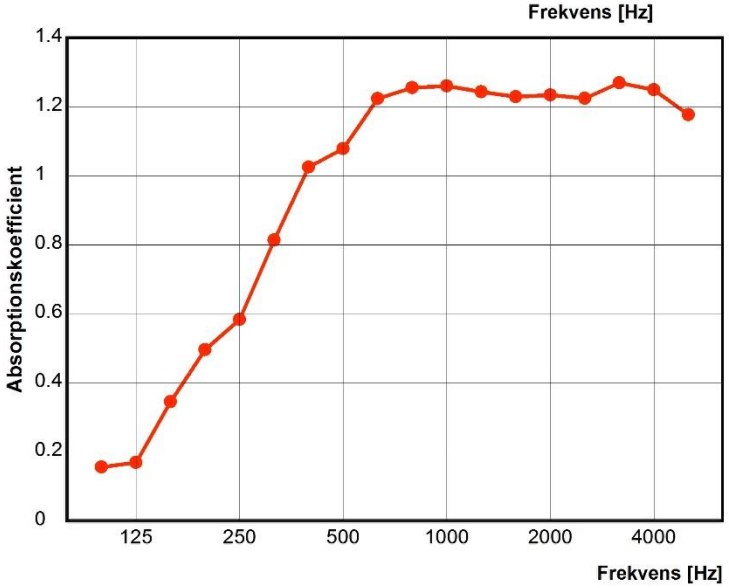
Client:	Akuart A/S	**Measurement no:**	A3
	Skudehavnsvej 1	**Measurement date:**	23-10-2019
	2150 Nordhavn	**Performed by:**	SERA

Test object:

Akuart SmartArt 60
4 panels of 1,20×2,40 m, mounted in 60 mm aluminium frames with 40 mm polyester panels (3.820 g/m^2) and 10 mm airspace behind the panels.
The test object was placed directly on the floor.

Frekv. [Hz]	Absorptionskoefficient		
	1/3-okt.	1/1-okt.	Ref.-kurve
100	0,16	0,20	
125	0,17		
160	0,35		
200	0,50	0,65	0,75
250	0,58		
315	0,81		
400	1,03	1,00	0,95
500	1,08		
630	1,22		
800	1,26	1,00	0,95
1000	1,26		
1250	1,24		
1600	1,23	1,00	0,95
2000	1,23		
2500	1,22		
3150	1,27	1,00	0,85
4000	1,25		
5000	1,18		





α_w = 0,95
Sound absorption class A

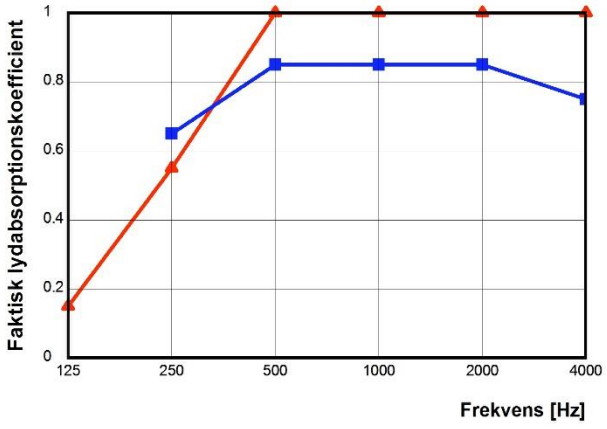
APPENDIX D – MEASUREMENT OF SOUND ABSORPTION COEFFICIENT

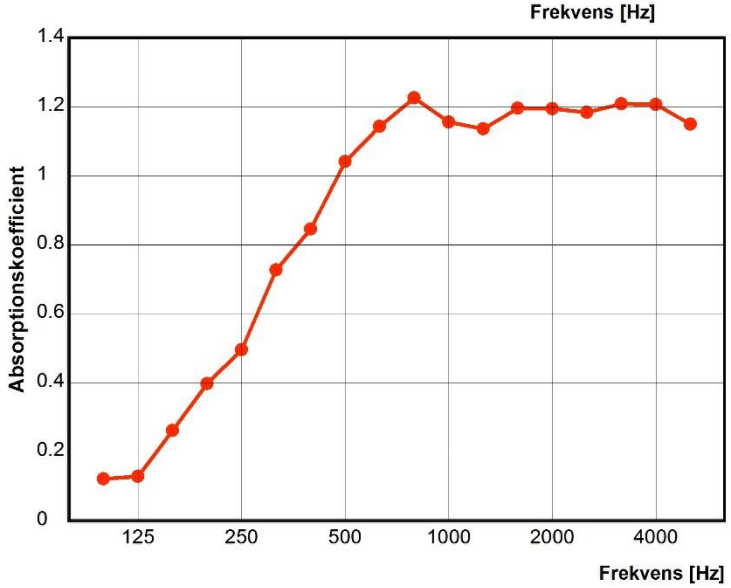
Client:	Akuart A/S	**Measurement no:**	A4
	Skudehavnsvej 1	**Measurement date:**	23-10-2019
	2150 Nordhavn	**Performed by:**	SERA

Test object:

40 mm eelgrass insulation batts
14 panels of 0,61×1,20 m, placed directly on the floor with uncovered perimeter edges (area of edges 0,50 m^2)

Frekv. [Hz]	Absorptionskoefficient		
	1/3-okt.	1/1-okt.	Ref.-kurve
100	0,12	0,15	
125	0,13		
160	0,26		
200	0,40	0,55	0,65
250	0,50		
315	0,73		
400	0,85	1,00	0,85
500	1,04		
630	1,14		
800	1,23	1,00	0,85
1000	1,16		
1250	1,14		
1600	1,20	1,00	0,85
2000	1,19		
2500	1,18		
3150	1,21	1,00	0,75
4000	1,21		
5000	1,15		





α_w = 0,85
Sound absorption class B(MH)

APPENDIX E: MEASUREMENT EQUIPMENT

Designation	Make	Type	ACA no.	Latest check	Next check
Sound level meter	Brüel & Kjær	2250	678	06-12-2017	06-12-2019
Microphone 1/2"	Brüel & Kjær	4165	556	14-12-2018	14-12-2020
Calibrator	Brüel & Kjær	4231	648	10-10-2019	10-10-2020
Omni directional speaker (active)	01dB	LS01	446	07-11-2017	07-11-2019